REV **D**

DOCUMENT NUMBER **570-7000**

PURPOSE:

This document is the Installation Manual for the AIU-1.

INSTALLATION MANUAL

for the

AIU-1 ANALOG INTERFACE UNIT

CHELTON FLIGHT SYSTEMS

REVISION HISTORY FOLLOWS ON PAGE 4.

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ANALOG INTERFACE UNIT (AIU-1) INSTALLATION MANUAL

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REVISION HISTORY

AIU Installation Manual, Document 570-7000

REV	DESCRIPTION	DATE	APPROVED
D	Per DCR 3213 1. Added rotorcraft pull test information in Chapter 2. 2. Modified Autopilot Interface section in Chapter 2 to simplify integration procedures. 3. Added Bendix M4D, Bendix FCS-810, Bendix/King KFC-200, Century 41, Century 2000, Collins AP-105, and Sfim PA 85 autopilot interfaces to Chapter 2 and wiring diagrams in Chapter 3. 4. Modified Ground Functional Tests for autopilot and flight director integration in Chapter 4. 5. Modified Flight Functional Tests for autopilot and flight director integration in Chapter 5.	10/18/04	R DuRall
C	Per DCR 3101 1. Modified environmental qualification section 4.0 in Chapter 1 2. Modified Autopilot Interface section in Chapter 2 to calculate for AC-rms and added additional examples 3. Added 5.897X and 11.12X capability for AC Datums and Bendix/King KFC-225, KFC-325, KFC-250, Cessna 1000, Collins APC-65A, AP-106, FCS-80, Honeywell SPZ-500, and S-Tec 65 autopilot interfaces to Chapter 2 and wiring diagrams in Chapter 3 4. Added Bendix/King KFC-300, S-Tec 20/30/30ALT, and SPZ-200 autopilot interface in Chapter 2 and Chapter 3 5. Corrected pin assignment of KFC-150 wiring diagram in Chapter 3 6. Modified Ground Functional Tests 7.20, 7.23, 8.17, and 8.20 for ILS testing at 0.093DDM and 0.155DDM deflection 7. Modified Glideslope Cancel Option A label to “Mom PB Switch” in Section 3.5.	6/9/04	D. Q
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	wiring diagram in Chapter 3 9. Corrected connector label on ADF interconnect wiring diagram in Chapter 3 10. Corrected pin labels on HDG and CRS output pins for 400 and 5KHz wiring diagrams in Chapter 3 11. Added Flight Director Null description in Chapter 4 12. Modified Heading Gain Flight Test Procedures in Chapter 6 13. Added Course Gain Flight Test Procedures in Chapter 6.		
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Chapter 1

Introduction

ABOUT THIS GUIDE

This guide provides instructions for installing the Chelton Flight Systems Analog Interface Unit (AIU). Use it for new or retrofit installations. The most recent version of this installation guide is always available online at www.cheltonflightsystems.com.

WARNING!
These instructions are intended for use by installers familiar with standard aircraft avionics practices and methods of installation. If you do not have prior experience with or knowledge of avionics installations, do not attempt the following installation. Chelton Flight Systems will not be held liable for damaged items resulting from improper handling and installation.

You will find the stylistic elements listed in **Table 1** used throughout this guide. These styles are used to emphasize text, to make the information more accessible to you during the installation, and to make the online manual more interactive.

This guide includes installation and checkout procedures for the AIU to standards described in FAA Advisory Circular 23-1311-1A.

Chapter 1 Provides an **introduction** to the AIU and includes a description of the AIU, parts list and list of special tools required.

Chapter 2 Includes **system installation** and AIU pin assignments.

Chapter 3 Includes **system drawings**, both mechanical and electrical.

Chapter 4 Includes **AIU configuration** program.

Chapter 5 Includes **ground functional test** procedures.

Chapter 6 Includes **flight functional test** procedures.

Chapter 7 Includes **troubleshooting** information.

Table 1 Installation Guide Style Conventions

Style	Description	Uses

1. Tasks	Numbered steps that together form a set of instructions for installing a specific EFIS component.	The numbered task guides you through the proper sequence of installation procedures.
Checklists ÿ	Installation procedures with checkboxes beside them. All the procedures in the checklist must be performed, but do not need to be performed in a specific order.	The checklist will help you track your installation progress. Write a checkmark in the checkbox after you complete each procedure.
NOTE:	Italicized text with black borders.	The note format is used to highlight and further explain certain installation and operational details.
WARNING! 	A graphical icon with an explanation point in the center, followed by bolded text with red borders.	This warning icon is used to flag important installation considerations. Failure to heed the information in the warnings could cause bodily harm, damage to the aircraft, or damage to the EFIS product.

UNPACKING THE AIU

System components are shipped in packaging designed to protect the components during transit. Carefully unpack and identify each component using the list on page 12. Check the contents of the package against the packing list in the box. Visually inspect each individual component for any signs of damage.

Keep all shipping containers and packaging in case you need to return any items. Contact Chelton Flight Systems immediately if you find missing or damaged components. Before returning anything, please contact Chelton Flight Systems by one of the means below.

Phone: (208) 389-9959
Fax: (208) 389-9961
E-mail:support@cheltonflightsystems.com

You must file a claim for a damaged product within 48 hours of receiving the equipment.

Most of the items required for installation are supplied in the original package from Chelton Flight Systems. You may order supplemental items (not included in the package) from Chelton Flight System separately to further aid the installation process.

SPECIAL TOOLS

In addition to a standard aircraft mechanic's tool set, you will need crimp tools and locators that meet MIL specification M22520. These tools will ensure consistent, reliable crimp contact connections. If you do not have these specialized tools, contact Chelton Flight Systems for sourcing information. Refer to **Table 2** below for specifications.

Table 2 Special Tools Parts List

Tool Description	Part Number
Crimp Tool	M22520/2-01
Locator	M22520/2-06
Locator	M22520/2-08
Locator	M22520/2-09
Insert/Removal	M81969/1-02
Insert/Removal	M81969/1-04

You should also have the following tools and supplies on hand:

- Loctite® 222 Medium Strength Threadlocker for sensors and probes as required.

- A digital multimeter for testing internal terminators on cable assemblies, and for testing voltage of various outputs.

- Laptop computer with the AIU Maintenance program loaded.

- RS-232 serial cable for connecting the laptop computer to the AIU maintenance plug.

SYSTEM DESCRIPTION

The Chelton Flight Systems AIU provides a data conversion function for the Chelton Flight Systems EFIS system. The unit receives inputs from navigation receivers, radar altimeters, marker beacon receivers, and autopilots, and translates them to digital data that is sent to the EFIS. The AIU also translates digital autopilot commands from the EFIS to analog steering signals that allow the EFIS to command an aircraft autopilot.

The AIU interface consists of two composite-Nav inputs, two Glideslope deviation inputs, a scaleable analog radar altimeter input, an ADF XYZ or ADF DC Sin/Cosine input, a flight director input, two ARINC-429 receivers, four RS-232 receivers, and eight discrete line inputs. The AIU also contains an autopilot left/right deviation output, heading and course datum outputs, deviation valid flag output, one ARINC-429 transmitter, four RS-232 transmitters, and one discrete line output.

The main function of the AIU is to provide the EFIS converted analog signals and to provide a means for the EFIS to control legacy analog autopilots. The AIU also brings in several discrete signals for Terrain Awareness Warning System (TAWS) requirements.

SYSTEM CONFIGURATION

The AIU contains a power supply, a digital signal processor, analog input/output (I/O) conditioners, and digital data I/O. The power supply provides conditioned voltages to all components in the AIU. The digital signal processor performs the analog-to-digital (A/D) and digital-to-analog (D/A) conversions and interfaces with the ARINC

and RS-232 drivers as determined by the software stored in its internal memory.
The analog I/O conditioners consist of: two VOR/LOC composite decoders, two glideslope deviation converters, a radar altimeter converter, a flight director vertical and lateral deviation converter, a DC sin/cosine converter, an ARINC-407 ADF XYZ converter, an autopilot course and heading datum generator, a left/right deviation generator, eight discrete input converters, and one discrete output.

The digital I/O consists of two ARINC-429 receivers, one ARINC-429 transmitter, four RS-232 receivers and four RS-232 transmitters.

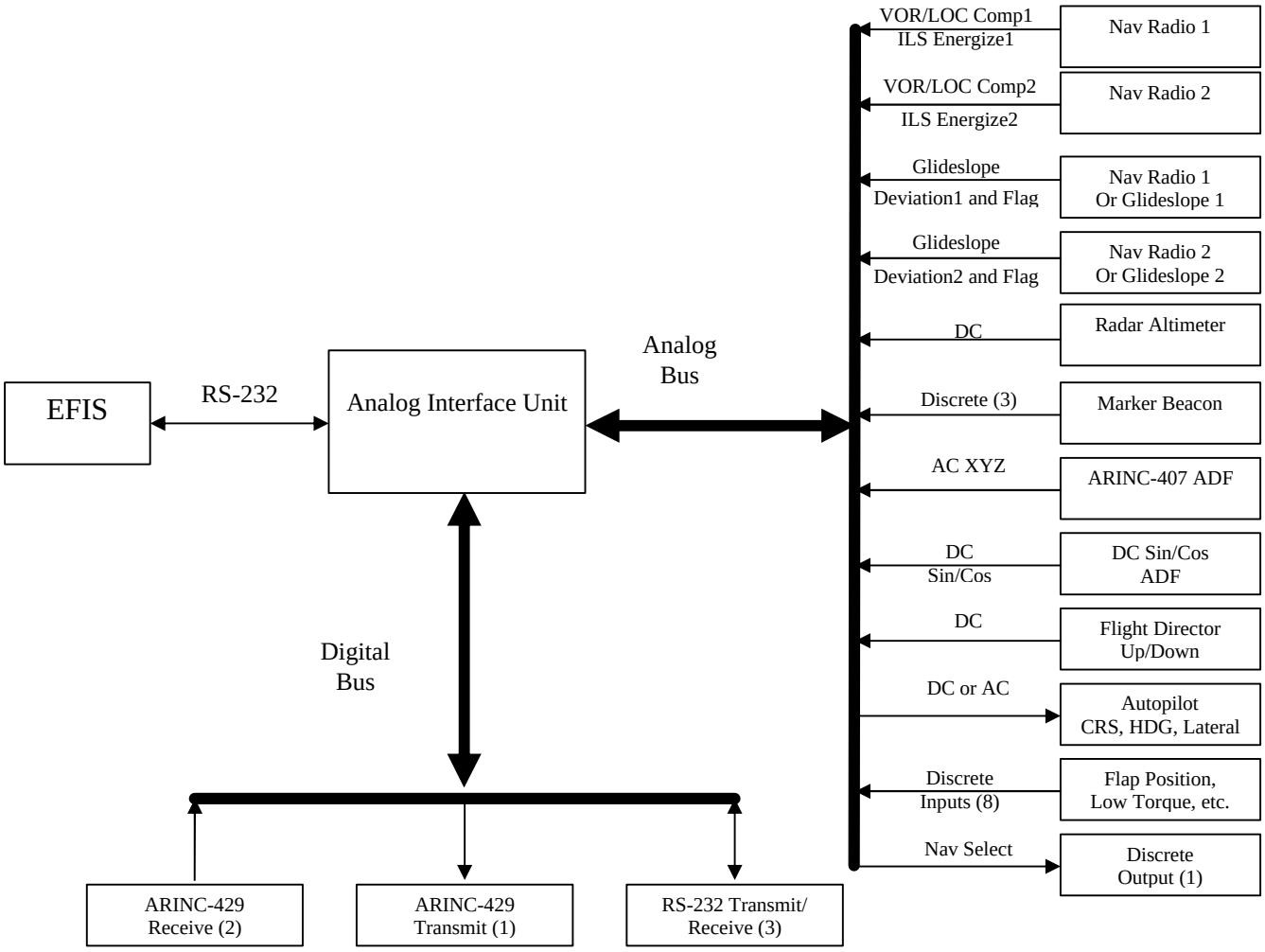


Figure 1 Block Diagram AIU System

SYSTEM COMPONENTS AND SPECIFICATIONS

The tables below describe the AIU and components of the installation kit provided with the unit.

Table 3. System Components and Specifications

Component	Description	Part No.	Specifications		
			Dimensions	Weight	Power
	Analog Interface Unit (AIU)	453-7000	5.05”w 3.08”h 8.12”d	2.2 lbs.	10-34VDC 0.5 Amps

Table 4. AIU Installation Kit, 455-0050

QTY	REFERENCE	DESCRIPTION	ITEM	ARTEX P/N
1	CON62F	CONNECTOR, D-SUB, 62 PIN-F	P1	150-6200
1	BACK62	BACKSHELL	P1	151-6764
1	CON44M	CONNECTOR, D-SUB, 44 PIN-M	J3	150-4400
1	BACK44	BACKSHELL	J3	151-6763
1	CON15HDF	CONNECTOR, D-SUB 15 PIN-F	P2	150-1500
1	BACK15	BACKSHELL	P2	151-6761
1	INSERT	INSERT/REMOVAL TOOL 22GA		145-0671
1	CON09M	CONNECTOR, D-SUB 9 PIN-M	P4	150-0900
1	SWTOGMOM	SWITCH, SPST. MOMENTARY	S9508	140-0008
1	PLACARD	PLACARD, G/S CANCEL		591-0060

AIU ENVIRONMENTAL QUALIFICATION

The AIU meets the following environmental testing requirements from DO-160D:

Table 5. AIU Environmental Qualifications

Sec.	*Condition*	*Cat.*	*Test Category Description*	*Notes*
4.0	Temperature and Altitude	D3	Equipment intended for installation in non-pressurized and non-controlled temperature location in an aircraft that is operated at altitudes up to 50,000 ft (15,200 m) MSL.	Operating Low Temp, Para 4.5.1 at -55°C with exception for LOC flag function to -20°C; Operating High Temp, Para 4.5.3 at +55°C; Short-Time Operating High Temp, Para 4.5.2 at +55°C; Loss of Cooling Test, Para 4.5.4 at +30°C; Ground Survival Low Temp, Para 4.5.1 at -55°C; Ground Survival High Temp, Para 4.5.2 at +85°C.
4.5.4	Loss of Cooling	X	Equipment intended for installation in non-pressurized and non-controlled temperature location in an aircraft that is operated at altitudes up to 50,000 ft (15,200 m) MSL.	Equipment requires no auxiliary cooling.
5.0	Temperature Variation	B	Equipment in a non-temperature-controlled internal section of the aircraft.	
6.0	Humidity	B	Equipment intended for installation in civil aircraft, non-civil transport aircraft and other classes, within non-environmentally controlled compartments of aircraft in which more severe humidity environment may be encountered.	
7.0	Operational Shocks & Crash Safety	B	Equipment generally installed in fixed-wing aircraft or helicopters and tested for standard operational shock and crash safety.	Level 5 for Crash Safety Sustained Test
8.0	Vibration	T + U	T - (Fixed-Wing) Demonstrates performance at higher vibration levels and after long term vibration exposure. It also demonstrates performance during high level - short duration vibration. U - (Helicopter w/Unknown Frequencies) Demonstrates performance at higher vibration levels and after long term vibration exposure for fuselage and instrument panel equipment when the specific rotor frequencies are unknown.	
15.0	Magnetic Effect	Z	Magnetic deflection distance less that 0.3m.	
16.0	Power Input	B	Equipment intended for use on aircraft electrical systems supplied by engine-driven alternator/rectifiers, or dc generators where a battery of significant capacity is floating on the dc bus at all times.	
17.0	Voltage Spike	A	Equipment intended primarily for installation where a high degree of protection against damage by voltage spikes is required.	
18.0	Audio Frequency Conducted Susceptibility-Power Inputs	B	Equipment intended for use on aircraft electrical systems supplied by engine-driven alternator/rectifiers, or dc generators where a battery of significant capacity is floating on the dc bus at all times.	
19.0	Induced Signal Susceptibility	C	Equipment intended primarily for operation in systems where interference-free operation is required and where severe coupling occurs due to long wire runs or minimum wire separation.	
20.0	Radio Frequency Susceptibility	W	Equipment and interconnecting wiring installed in severe electromagnetic environments. Such environments might be found in non-metallic aircraft or exposed areas in metallic aircraft.	

Sec.	*Condition*	*Cat.*	*Test Category Description*	*Notes*
21.0	Emission of Radio Frequency Energy	M	Equipment and interconnected wiring located in areas where apertures are EM significant and not directly in view of the radio receiver's antenna. This category may be suitable for equipment and associated interconnecting wiring located in the passenger cabin or cockpit of a transport aircraft.	
22.0	Lightning Induced Transient Susceptibility	A3G33	Equipment interconnected with wiring installed within airframes or airframe sections where apertures, not structural resistance, are the main source of induced transients as would be the case in all-metal airframes, airframes composed of metal framework and composite skin panels or carbon fiber composite airframes whose major surface areas have been protected with metal meshes or foils. Level 3 designates equipment and interconnecting wiring installed in a moderately exposed environment.	Cat. A pin injection tests. Cat. G cable bundle single stroke, multiple stroke, and multiple burst tests. Tested by similarity.
25.0	Electrostatic Discharge	A	Electronic equipment that is installed repaired or operated in an aerospace environment.	

AIU TSO APPLICABILITY

The AIU meets the following TSO requirements:

Table 6. AIU TSO Applicability

TSO	Title	MOPS
TSO-C34e	ILS Glide Slope Receiving Equipment Operating Within the Radio Frequency Range of 328.6-335.4 MHz (partial)	RTCA/DO-192
TSO-C35d	Airborne Radio Marker Receiving Equipment (partial)	RTCA/DO-143
TSO-C36e	Airborne ILS Localizer Receiving Equipment Operating Within the Radio Frequency Range of 108-112 MHz (partial)	RTCA/DO-195
TSO-C40c	VOR Receiving Equipment Operating Within the Radio Frequency Range of 108-117.95 MHz (partial)	RTCA/DO-196
TSO-C41d	Airborne Automatic Direction Finding (ADF) Equipment (partial)	RTCA/DO-179
TSO-C52b	Flight Director Equipment (partial)	SAE AS8008
TSO-C87	Airborne Low-Range Radio Altimeter (partial)	RTCA/DO-155
TSO-C146a	Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS) (partial)	RTCA/DO-229C

Chapter 2

System Installation

INSTALLATION OVERVIEW

Installation will typically follow these steps, which are explained in detail later in this chapter:

1. Perform a pre-mod avionics system check to verify that all interfaced avionics are functioning properly.

2. Determine the appropriate location for the AIU and make any necessary airframe modifications.

3. Route composite Nav and glideslope from No. 1 Nav system (if installed) to AIU.

4. Route composite Nav and glideslope from No. 2 Nav system (if installed) to AIU.

5. Route Marker Beacon wires from audio panel or marker beacon receiver (if installed) to AIU.

6. Route wiring from ADF (if installed) to AIU.

7. Route Radar Altimeter wiring (if installed) to AIU.

8. Route wiring from AIU to aircraft autopilot (if installed).

9. Route wiring from aircraft autopilot flight director to AIU (if installed).

10. Discrete switch interfacing as required.

11. Annunciated switch interfacing as required.

Task 1. Pre-mod Avionics Systems Check

Perform a pre-modification avionics system check of all interfaced equipment. Verify that all systems are functioning properly in accordance with the applicable aircraft maintenance manuals. If any discrepancies are noted, generate the appropriate paper work and record these discrepancies.

Task 2. Determine the Location of the AIU

The AIU should be installed as close to the existing navigation equipment as practical. This will reduce signal losses and potential external interferences that longer wire runs are susceptible to.

The AIU can be mounted vertically or horizontally by using the appropriate mounting holes located on the end plates of the unit. Upon determination of a suitable existing shelf, or completion of a new equipment shelf, a static load test must be performed per AC 43.13-2A, Chapter1, §2 and §3 to determine proper load bearing and security of the equipment. A typical aircraft operating in Normal FAR 23 (CAR 3) category will require a test of the shelf as follows:

Fixed Wing			**Rotorcraft**	
Direction of Pull	**Load Factor**	**Static Test Load** (*Load factor x AIU Weight*)	**Load Factor**	**Static Test Load** (*Load factor x AIU Weight*)
Sideways	1.5g	(1.5 x 2.2) = 3.3 Lbs	2.0g	(2.0 x 2.2) = 4.4 Lbs
Upwards	3.0g	(3.0 x 2.2) = 6.6 Lbs	1.5g	(1.5 x 2.2) = 3.3 Lbs
Forwards	9.0g	(9.0 x 2.2) = 19.8 Lbs	5.25g	(5.25 x 2.2) = 11.5 Lbs
Downwards	6.6g	(6.6 x 2.2) = 14.5 Lbs	4.0g	(4.0 x 2.2) = 8.8 Lbs

The installer will make a simple test jig that will be used to measure the static test loads as shown in the table above. Perform the tests at the center of gravity of the AIU and record the completion of the test in the Ground Maintenance section of this manual. An acceptable installation will show no signs of permanent deformation after 3 seconds of applied pressure in all directions of pull.

Mount the AIU in accordance with drawing 3.1 of Chapter 3. Use a minimum of four 8-32 screws (MS27039-0807) and four #8 washers (NAS1149F0832P) or equivalent with installer supplied AN, MS, or NAS nuts, nut clips, or nut plates as required.

Task 3. Install AIU Cable Assembly

Fabricate the AIU cable assembly using the wiring diagrams in Chapter 3, drawings 702-045250, and 702-045251. The cable assembly will vary depending on the navigation interface, autopilot interface, and class of TAWS required for the installation.

Power and Ground

The AIU operates from 10 to 30VDC.

Label	J2	Description
POWER	1	10 TO 30VDC
POWER	6	10 TO 30 VDC
GROUND	2	MAIN GROUND
GROUND	7	MAIN GROUND
Label	**P3**	**Description**
14VDC POWER	18	10 TO 14VDC
28VDC POWER	19	22 TO 28VDC
GROUND	7	MAIN GROUND

CAUTION: *ConnectJ3 power to either 14VDC or 28VDC input, but not both.*

Additional Grounds

Label	J1
GROUND	3
GROUND	9
GROUND	20
GROUND	33
GROUND	46
GROUND	50
GROUND	51
GROUND	53
GROUND	62
Label	**P3**
GROUND	8
GROUND	15

Serial Communications

AIU Main Communication Port

The main communication port from the AIU to the EFIS is on Com1 (RS-232). See drawing 701-045250 and AIU wiring (Chapter 3) for additional information on AIU to EFIS interfacing.

Label	J1	Description
COM 1 TX	23	TO EFIS
COM 1 RX	22	FROM EFIS
COM 1 GND	44	GND

AIU Maintenance Port

The AIU is programmed by connecting the Com2 (RS-232) port of the AIU to a computer serial port. Refer to the AIU Maintenance section Chapter 4.

NOTE: *AIU Maintenance plug should be mounted in the flight compartment for access during flight as described in Chapter 6.*

Label	J1	Description
COM 2 TX	26	TO MAINT
COM 2 RX	25	FROM MAINT
COM 2 GND	24	GND

ARINC-429

There are two ARINC-429 receive and one ARINC-429 transmit ports. These input ports are not defined at this time.

Label	J1	Description
COM 6 RXA (+)	1	UNDEFINED
COM 6 RXB (-)	2	UNDEFINED
COM 5 RXA (+)	4	UNDEFINED
COM 5 RXB (-)	5	UNDEFINED
COM 5 TXA (+)	7	OUTPUT DATA
COM 5 TXB (-)	8	OUTPUT DATA

RS-232

There are four RS-232 transmit and receive ports. One is the main communications port to the EFIS, one is the ground maintenance port for alignment and setup and two are undefined at this time.

Label	J1	Description
COM 3 TX	29	UNDEFINED
COM 3 RX	28	UNDEFINED
COM 3 GND	27	GND
COM 4 TX	32	UNDEFINED
COM 4 RX	31	UNDEFINED
COM 4 GND	30	GND

Nav 1 Interface

The Nav 1 interface consists of one or more of the following:

Composite VOR/LOC

VOR signal consisting of a 9960 Hz carrier frequency at a nominal signal level of 0.5 VRMS ±0.05 VRMS which is AM modulated at 30 Hz and FM modulated at 30 Hz.

LOC signal consisting of a mixed 90 Hz and 150 Hz signal at a nominal signal level of 0.35 VRMS ±0.035 VRMS.

Label	J1	Description
COMPOSITE 1	37	COMPOSITE VOR/LOC NAV 1
COMPOSITE 1 LOW	36	COMPOSITE VOR/LOC LOW

ILS Energize

ILS Energize signal is ground for valid.

Label	J1	Description
ILS ENERGIZE 1	13	ILS ENERGIZE NAV 1

Glideslope Deviation

Glideslope deviation input provides full-scale deflection of ±150mV with an impedance of 1000 ohms. An input of +75mV ±1.171mV will provide a one-dot deflection.

Label	J1	Description
GLIDESLOPE 1 +UP	54	150MV GS1 UP
GLIDESLOPE 1 +DN	55	150MV GS1 DN

Glideslope Flag

A valid glideslope will be sensed when the input is at 375mV ±80mV at 1000 ohms of impedance. A flagged condition will be sensed when the input is at 0v ±25mV.

Label	J1	Description
GLIDESLOPE 1 +FLAG	58	GS1 FLAG
GLIDESLOPE 1 –FLAG	59	GS1 FLAG

Nav 2 Interface

The Nav 2 Interface is the same as the Nav 1 interface with respect to signal inputs. Nav 2 can contain composite VOR/LOC, glideslope, or both.

Label	J1	Description
COMPOSITE 2	38	COMPOSITE VOR/LOC NAV 2
COMPOSITE 2 LOW	19	COMPOSITE VOR/LOC LOW
ILS ENERGIZE 2	14	ILS ENERGIZE NAV 2
GLIDESLOPE 2 +UP	56	150MV GS2 UP
GLIDESLOPE 2 +DN	57	150MV GS2 DN
GLIDESLOPE 2 +FLAG	60	GS2 FLAG
GLIDESLOPE 2 –FLAG	61	GS2 FLAG

ILS Energize and Glideslope Select

Selection of Glideslope 1/2 and ILS Energize 1/2 is accomplished on AIU J3. The G/S SELECT OUT line from AIU P1 to AIU J3 GLIDESLOPE 1/2 sets the logic for autopilot drive.

Label	J1	Description
G/S SELECT OUT	45	G/S 1 / G/S 2 SELECT

When the G/S SELECT is open, the Glideslope 1 Up/Down, Flag, and ILS Energize 1 are passed to the autopilot. When the G/S SELECT is ground, the Glideslope 2 Up/Down, Flag, and ILS Energize 2 are passed to the autopilot.

Label	P3	Description
GLIDESLOPE 1/2	20	FROM P1, PIN 45
GLIDESLOPE 1 +UP	23	FROM GLIDELSOPE 1 +UP
GLIDESLOPE 2 +UP	25	FROM GLIDESLOPE 2 +UP
GLIDESLOPE +UP OUT	21	TO AUTOPILOT +UP
GLIDESLOPE 1 +DN	24	FROM GLIDESLOPE 1 +DN
GLIDESLOPE 2 +DN	26	FROM GLIDESLOPE 2 +DN
GLIDESLOPE +DN OUT	22	TO AUTOPILOT +DN
GLIDESLOPE 1 +FLAG	32	FROM GLIDESLOPE 1 +FLAG
GLIDESLOPE 2 +FLAG	34	FROM GLIDESLOPE 2 +FLAG
GLIDESLOPE +FLAG OUT	30	TO AUTOPILOT +FLAG
GLIDESLOPE 1 –FLAG	33	FROM GLIDESLOPE 1 –FLAG
GLIDESLOPE 2 –FLAG	35	FROM GLIDESLOPE 2 –FLAG
GLIDESLOPE –FLAG OUT	31	TO AUTOPILOT –FLAG
ILS ENERGIZE 2	38	FROM NAV1 ILS ENERGIZE
ILS ENERGIZE 1	40	FROM NAV2 ILS ENERGIZE
ILS ENERGIZE OUT	36	TO AUTOPILOT ILS ENERGIZE
SPARE A	39	NC
SPARE B	41	NC
SPARE OUT	37	NC

Marker Beacon Interface

The marker beacon input will be sensed as valid when the input exceeds a programmable level from the AIU Ground Maintenance functions (+3.0vdc default). The marker beacon logic can be configured as active high or active low. Only one marker beacon input will be considered active at any time.

Label	J1	Description
MARKER BLUE	10	OUTER MARKER
MARKER WHITE	11	INNER MARKER
MARKER YELLOW	12	MIDDLE MARKER

If the marker beacon receiver uses an active low (ground) to signal a valid light, then the optional wiring of AIU J3 is required to maintain a voltage on the pins until the receiver sends a valid state.

Label	J3	Description
MARKER BLUE PWR	27	5-28VDC EXCITATION, BLUE
MARKER BLUE	28	CONNECTED TO P1, PIN 10
MARKER WHITE PWR	29	5-28VDC EXCITATION, WHITE
MARKER WHITE	44	CONNECTED TO P1, PIN 11
MARKER YELLOW PWR	42	5-28VDC EXCITATION, YELLOW

MARKER YELLOW	43	CONNECTED TO P1, PIN 12

ADF Interface

The ADF input can interface with either an ARINC 407 XYZ input or a DC Sin/Cos, but not both, as only one ADF receiver will be interfaced at any time. The ADF interface is as follows:

ARINC 407 XYZ

A standard 11.8 VRMS, 400 Hz ARINC 407 XYZ input will be accepted for a valid ADF input.

Label	J2	Description
ADF X	3	
ADF Y	4	
ADF Z	5	
ADF REF	8	AC REFERENCE FOR XYZ

DC Sin/Cos

The Bendix/King (Honeywell) KR-87 interface has been selected as the standard for the DC Sin/Cos input. This input uses a +4.5 Vdc reference with a Sin and Cosine signal that is 3xSin (bearing) and 3xCosine (bearing) volts with respect to the reference.

Label	J2	Description
ADF DC REF	13	DC REFRENCE FOR SIN/COS
ADF SIN	14	DC SINE
ADF COS	15	DC COSINE

Radar Altimeter Interface

The Radar Altimeter input can be selected between three states, none, ARINC 552A, and ALT-55. Selecting none causes the AIU to ignore any voltage on the RADALT input and forces the EFIS to only report barometric AGL below 2500 feet. Selecting one of the other two allows the EFIS to report radar altitude below 2500 feet AGL for Class-A TAWS. The two programmed inputs are as follows:

ARINC 552A

The ARINC 552A specification is as follows:

-20 to 480 ft. V=0.02h + 0.4
480 to 2550 ft V=10 ln (h + 20) -52.1461

ALT 55

The ALT-55 specification is as follows:

-20 to 500 ft V=0.02h + 0.4
500 to 2500 ft V=0.003(h – 500) + 10.4

Label	J1	Description
RADALT IN	49	RADAR ALTIMETER DC INPUT
RADALT LOW	6	GND
RADALT FLAG	52	A+ FOR VALID

Selection programming is provided by the AIU Ground Maintenance functions (ARINC 552A is default).

Autopilot Interface

The Chelton EFIS is designed to emulate the signals provided by an existing HSI connected to an autopilot. The Integrated Display Units (IDU) and Analog Interface Unit (AIU) provide Heading Datum, Course Datum, and horizontal deviations with flag for autopilot drive. The AIU also switches Glideslope deviation with flag and ILS Energize signals from two Nav receivers to the autopilot depending on the Nav source selected in the IDU.

HSI EMULATION

Most HSI emulation is performed by the AIU. The technician will need to set the AIU to match the Course and Heading Datum characteristics of the original HSI. This is performed by setting the GAIN through dip-switches in the AIU and SCALING through software.

It is strongly advised to measure the Heading and Course datums outputs of the original HSI while connected to the autopilot prior to start of aircraft modification. Measurements of these voltages are the only way to ensure proper operation of the autopilot when connected to the EFIS.

CAUTION: Ensure the autopilot is performing within the manufacturers specifications prior to starting the installation. Once installed, the EFIS may exaggerate deficiencies in the autopilot causing undesirable flying characteristics.

The first step is to measure the original HSI Course and Heading Datums while still connected to the autopilot in the aircraft. This will give the technician actual voltage measurements under a load condition. Heading Datum should be measured every 5° left and right from null (0°) to 30°. Course Datum should be measured every 5° left and right from null to 55°. Table 7 is provided to note these values.

DEGREE	HEADING	COURSE
55 Left		
50 Left		
45 Left		
40 Left		
35 Left		
30 Left		
25 Left		
20 Left		
15 Left		
10 Left		
5 Left		
0 (Null)		
5 Right		

10 Right		
15 Right		
20 Right		
25 Right		
30 Right		
35 Right		
40 Right		
45 Right		
50 Right		
55 Right		

Table 7. Existing HSI Heading and Course Datum

The values in Table 7 will be used to determine the Datum Scaling (linear or sine), the GAIN, and the SCALING set into the AIU. These measurements can be performed using a DMM or oscilloscope depending on the type of datum (DC or AC). If using a DMM for AC measurements, be sure you know the unit (voltage peak, RMS, etc.) and note these in the table as well.

DATUM SCALING

The Datum Scaling is determined by examining the values in the table. If the difference in voltage is the same for all values of one Datum, then the Scaling is considered linear. If the voltage difference changes, especially near the 40° and 50° measurements, then the Scaling is considered sine.

Table 8 shows the difference between a linear and a sine Datum using 200mV/Deg as the output scale.

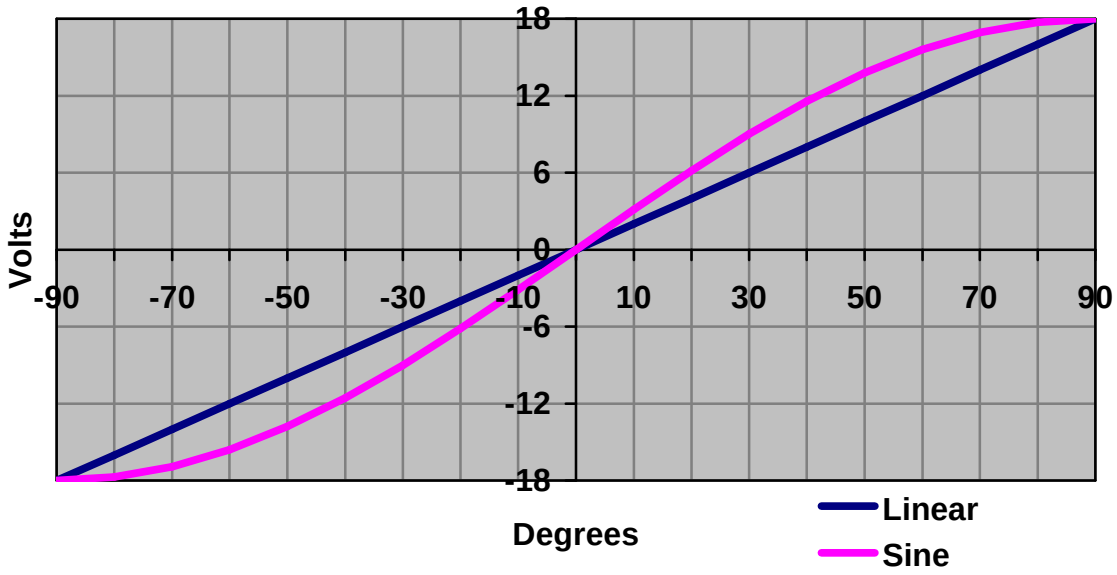


Table 8. Sine vs. Linear Graph

TRANSFORMER MULTIPLICATION

If the Course and Heading Datums are DC, then the transformer multiplication is not used. If the Datums are AC, then the technician must determine if a transformer multiplication is required to generate enough voltage to properly drive the autopilot. An AC Datum output will require transformer multiplication (X2) if the required output is greater than 11.3Vrms.

GAIN CALCULATION

Knowing the maximum voltage, Datum Scaling, and transformer multiplication (if applicable), the GAIN setting can be calculated. This is done using one of the following formulas:

DC Linear:

$$\text{GAIN} = \frac{\text{OUTPUT x 90}}{\text{ANGLE x 3.33}}$$

DC Sine:

$$\text{GAIN} = \frac{\text{OUTPUT}}{\text{Sin (ANGLE) x 3.33}}$$

AC Linear:

$$GAIN = \frac{OUTPUT \times 90}{ANGLE \times XFMR \times 1.94}$$

AC Sine:

$$GAIN = \frac{OUTPUT}{Sin\,(ANGLE) \times XFMR \times 1.94}$$

Where OUTPUT is the maximum voltage from Table 7, ANGLE is the Datum angle at which the voltage is maximum from Table 7, and XFMR is the transformer multiplication (X1 or X2). Once the GAIN has been determined, the DIP switches can be set per Figures 3 and 4 of this chapter.

Example: The voltage measured from the existing HSI at 55° of Course was 14.74Vrms. A X2 transformer multiplication is required due to the voltage, so:

$$GAIN = \frac{14.74}{Sin\,(55) \times 2 \times 1.94}$$

$$GAIN = 4.638$$

The DIP switch GAIN setting would be 4.885X. Do not set the DIP switch GAIN until the SCALING has been calculated as described below.

The AIU can produce Heading and Course Datum signals that are either DC or AC signals. A 9 pin DIP switch and a two position slider switch are used to configure the AIU for AC or DC operation, and to select hardware gains. The switches are located at the connector end of the unit, and are accessed behind a removable cover plate.

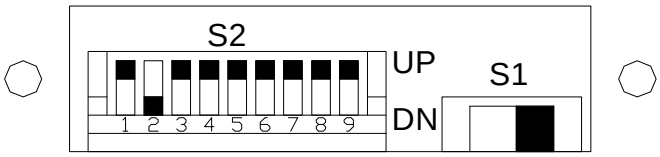


Figure 2. AIU Switch Access

NOTE: *For switch S2, "Down" is determined when the tab of the position is pointed at the numbers on the switch.*

The slider switch (S1) must be in the left position for DC operation, or right for AC operation.

The 9 pin DIP switch (S2) are assigned to the following functions, position 1 is the left-most switch:

WARNING!
Switches S1 and S2 must be set to the autopilot Course and Heading Datum operation and gain as defined above prior to application of power. Failure to set the switches may result in erroneous autopilot operations. Consult the tables below for assistance in setting the switches.

Table 9. AIU Course and Heading Datum Switches

Position	Description
1	DOWN SELECTS DC MODE OPERATION (SWITCH 2 MUST BE UP)
2	DOWN SELECTS AC MODE OPERATION (SWITCH 1 MUST BE UP)
3	HEADING DATUM GAIN (SEE FIG 3)
4	HEADING DATUM GAIN (SEE FIG 3)
5	HEADING DATUM GAIN (SEE FIG 3)
6	COURSE DATUM GAIN (SEE FIG 4)
7	COURSE DATUM GAIN (SEE FIG 4)
8	COURSE DATUM GAIN (SEE FIG 4)
9	UNUSED (UP)

3	4	5	Gain	Mode
			1X	AC or DC
			2X	AC or DC
			4.885X	AC or DC
			5.897X	AC or DC

			11.12X	AC or DC
			12.13X	AC or DC
			15X	AC or DC
			16.01X	AC or DC

Figure 3. Heading Datum Gain Switch Position

6	7	8	Gain	Mode
			1X	AC or DC
			2X	AC or DC
			4.885X	AC or DC
			5.897X	AC or DC
			11.12X	AC or DC
			12.13X	AC or DC
			15X	AC or DC
			16.01X	AC or DC

Figure 4. Course Datum Gain Switch Position

SCALING CALCULATION

The final step is to calculate the Scaling value for the AIU. The formulas described above can be modified to produce the Heading and Course Scaling values that will be programmed into the AIU Maintenance program. The SCALING value will provide an exact match of the AIU Datum output voltage compared to the HSI that is being replaced.

DC Linear:

OUTPUT x 90 x 3300

$$SCALING = \frac{OUTPUT \times 90 \times 3300}{ANGLE \times 3.33 \times GAIN}$$

DC Sine:

$$SCALING = \frac{OUTPUT \times 3300}{\sin(ANGLE) \times 3.33 \times GAIN}$$

AC Linear:

$$SCALING = \frac{OUTPUT \times 90 \times 3300}{ANGLE \times XFMR \times 1.94 \times GAIN}$$

AC Sine:

$$SCALING = \frac{OUTPUT \times 3300}{\sin(ANGLE) \times XFMR \times 1.94 \times GAIN}$$

Where OUTPUT is the maximum voltage from Table 7, ANGLE is the Datum angle at which the voltage is maximum from Table 7, XFMR is the transformer multiplication (X1 or X2), and GAIN is the gain value calculated from the previous step. Once all of these values have been calculated, the AIU can be programmed to emulate the existing HSI.

The SCALING value shall not be less than 1500 or greater than 3300. If it is less than 1500, then the next lower GAIN setting must be used and the SCALING should be re-calculated. If it is greater than 3300, then the next higher GAIN setting must be used and the SCALING should be re-calculated.

Example: Using the values stated in the previous example, the SCALING can be calculated as:

$$SCALING = \frac{14.74 \times 3300}{\sin(55) \times 2 \times 1.94 \times 4.885}$$

$$SCALING = 3133$$

The AIU DIP switches will be set to the 4.885X value, and the *Autopilot Scaling – Course* in the AIU Maintenance program will be set to 3133. Calculations for Heading Datum will be similar using Table 7.

Once the scaling has been calculated, these values should be programmed into the AIU using the AIU Maintenance program as described in Chapter 4.

Determine the proper polarity of the Heading and Course Datums by referring to the autopilot documentation or ground testing. The proper polarity will be programmed into the AIU using the AIU Maintenance program as described in Chapter 4.

Heading and Course Datum nulls will be programmed in the AIU using the AIU Maintenance program as described in the Ground Functional Test (Chapter 5) and Flight Functional Test (Chapter 6).

Use the following tables to aid in initial setup of the AIU. Ground and flight testing after installation are required to properly align the AIU to the autopilot.

NOTE: *The information contained in the following tables is to be used as initial settings. Ground and flight tests must be performed to fully align the EFIS to the autopilot.*

Bendix M4D

SETTING	VALUE

DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	DOWN
DIP SW 8	DOWN
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	2200
AUTOPILOT HEADING POLARITY	+ LEFT
AUTOPILOT SCALING – COURSE	2700
AUTOPILOT COURSE POLARITY	+ LEFT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	17mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	17mV
FLIGHT DIRECTOR VERT POLARITY	+ DOWN
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

NOTE: *ILS Energize signal from AIU drives an airplane relay to switch +28VDC signal. Autopilot requires active high for ILS Energize.*

Bendix FCS-810

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN

DIP SW 3	DOWN
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	DOWN
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	3300
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	3150
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	N/A
FLIGHT DIRECTOR HORZ POLARITY	N/A
FLIGHT DIRECTOR SCALING – VERTICAL	N/A
FLIGHT DIRECTOR VERT POLARITY	N/A
FLIGHT DIRECTOR VALID FLAG	N/A
TRANSFORMER INPUT	X2

NOTE: *Flight Director interface is not authorized for the Chelton EFIS with the Bendix FCS-810 autopilot. If the aircraft requires Flight Director for operations per the Pilots Operating Handbook or Airplane Flight Manual Supplement, an alternate Flight Director display is required on the Pilot's Instrument Panel.*

Bendix/King (Honeywell) KFC-150 with KI-525A

SETTING	**VALUE**
DIP SW 1	DOWN
DIP SW 2	UP
DIP SW 3	UP
DIP SW 4	DOWN

DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	DOWN
DIP SW 9	UP
SLIDE SWITCH SW1	LEFT
AUTOPILOT SCALING – HEADING	3250
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	1650
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	75mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	74mV
FLIGHT DIRECTOR VERT POLARITY	+ DOWN
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	N/A

Bendix/King (Honeywell) KFC-200

SETTING	**VALUE**
DIP SW 1	DOWN
DIP SW 2	UP
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	DOWN
DIP SW 6	UP

DIP SW 7	UP
DIP SW 8	DOWN
DIP SW 9	UP
SLIDE SWITCH SW1	LEFT
AUTOPILOT SCALING – HEADING	3300
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	2000
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	100mV
FLIGHT DIRECTOR HORZ POLARITY	+ RIGHT
FLIGHT DIRECTOR SCALING – VERTICAL	75mV
FLIGHT DIRECTOR VERT POLARITY	+ DOWN
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	N/A

Bendix/King (Honeywell) KFC-225 with KI-525A

SETTING	**VALUE**
DIP SW 1	DOWN
DIP SW 2	UP
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	DOWN

DIP SW 9	UP
SLIDE SWITCH SW1	LEFT
AUTOPILOT SCALING – HEADING	3250
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	1650
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	200mV
FLIGHT DIRECTOR HORZ POLARITY	+ RIGHT
FLIGHT DIRECTOR SCALING – VERTICAL	200mV
FLIGHT DIRECTOR VERT POLARITY	+ DOWN
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	N/A

Bendix/King (Honeywell) KFC-250 with EFIS

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	DOWN
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	DOWN
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT

AUTOPILOT SCALING – HEADING	3300
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	3300
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	300mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	300mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

Bendix/King (Honeywell) KFC-300

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	DOWN
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	DOWN
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	3300
AUTOPILOT HEADING POLARITY	+ RIGHT

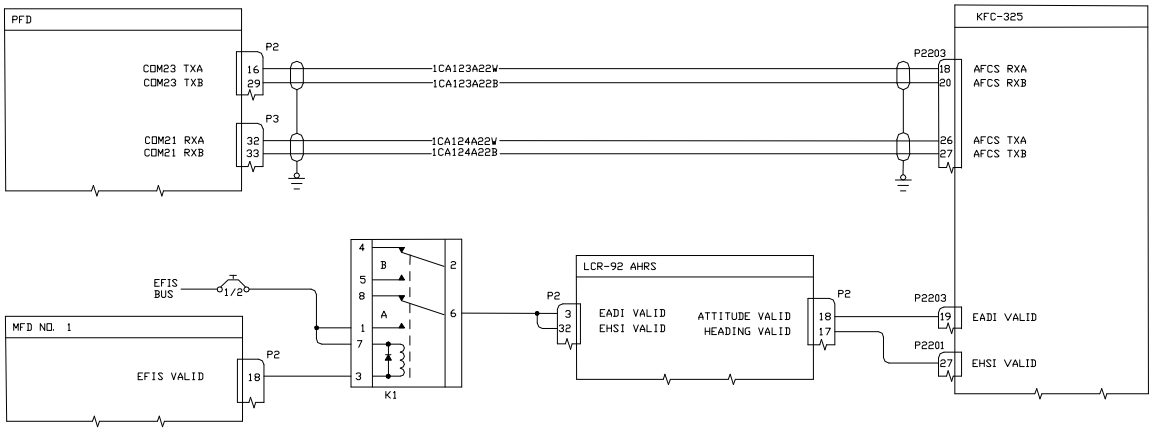
AUTOPILOT SCALING – COURSE	3300
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	400mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	200mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

Bendix/King (Honeywell) KFC-325 with EFIS

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	UP
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	3300
AUTOPILOT HEADING POLARITY	+ LEFT
AUTOPILOT SCALING – COURSE	3300
AUTOPILOT COURSE POLARITY	+ LEFT

AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	475mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	300mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

NOTE: *This interface was performed with a KAP 220 -15 autopilot and Litef LCR-92 AHRS on a Pilatus PC-12. To emulate the original Bendix/King EFIS-40/50 installation, the following wiring was added:*



Century 41

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	DOWN
DIP SW 4	UP
DIP SW 5	UP
DIP SW 6	DOWN
DIP SW 7	UP
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	
AUTOPILOT HEADING POLARITY	+
AUTOPILOT SCALING – COURSE	
AUTOPILOT COURSE POLARITY	+
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	N/A

FLIGHT DIRECTOR HORZ POLARITY	N/A
FLIGHT DIRECTOR SCALING – VERTICAL	N/A
FLIGHT DIRECTOR VERT POLARITY	N/A
FLIGHT DIRECTOR VALID FLAG	N/A
TRANSFORMER INPUT	N/A

NOTE: *Flight Director interface is not authorized for the Chelton EFIS with the Century 41 autopilot. If the aircraft requires Flight Director for operations per the Pilots Operating Handbook or Airplane Flight Manual Supplement, an alternate Flight Director display is required on the Pilot's Instrument Panel.*

Century 2000

SETTING	**VALUE**
DIP SW 1	DOWN
DIP SW 2	UP
DIP SW 3	DOWN
DIP SW 4	DOWN
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	DOWN
DIP SW 9	UP
SLIDE SWITCH SW1	LEFT
AUTOPILOT SCALING – HEADING	1600
AUTOPILOT HEADING POLARITY	+ LEFT
AUTOPILOT SCALING – COURSE	1600
AUTOPILOT COURSE POLARITY	+ LEFT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	N/A
FLIGHT DIRECTOR HORZ POLARITY	N/A
FLIGHT DIRECTOR SCALING – VERTICAL	N/A

FLIGHT DIRECTOR VERT POLARITY	N/A
FLIGHT DIRECTOR VALID FLAG	N/A
TRANSFORMER INPUT	N/A

NOTE: *Flight Director interface is not authorized for the Chelton EFIS with the Century 2000 autopilot. If the aircraft requires Flight Director for operations per the Pilots Operating Handbook or Airplane Flight Manual Supplement, an alternate Flight Director display is required on the Pilot's Instrument Panel.*

Cessna 400/800 Autopilot with IG-832A HSI

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	UP
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	2370
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	2370
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	12mV
FLIGHT DIRECTOR HORZ POLARITY	+ RIGHT
FLIGHT DIRECTOR SCALING – VERTICAL	20mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH

TRANSFORMER INPUT	X2

Cessna 1000 Autopilot

SETTING	VALUE
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	UP
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	2600
AUTOPILOT HEADING POLARITY	+ LEFT
AUTOPILOT SCALING – COURSE	2600
AUTOPILOT COURSE POLARITY	+ LEFT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	12mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	12mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

Chelton AP-3C Autopilot

SETTING	VALUE
DIP SW 1	DOWN
DIP SW 2	UP
DIP SW 3	UP
DIP SW 4	UP
DIP SW 5	DOWN
DIP SW 6	N/A
DIP SW 7	N/A
DIP SW 8	N/A
DIP SW 9	UP
SLIDE SWITCH SW1	LEFT
AUTOPILOT SCALING – HEADING	3250
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	N/A
AUTOPILOT COURSE POLARITY	N/A
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	N/A
FLIGHT DIRECTOR HORZ POLARITY	N/A
FLIGHT DIRECTOR SCALING – VERTICAL	N/A
FLIGHT DIRECTOR VERT POLARITY	N/A
FLIGHT DIRECTOR VALID FLAG	N/A
TRANSFORMER INPUT	N/A

NOTE: *Chelton AP-3C autopilot does not contain an input for Course Datum or Flight Director output.*

Collins APS-65

SETTING	VALUE
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	UP
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	DOWN
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	3000
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	3000
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	150mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	50mV
FLIGHT DIRECTOR VERT POLARITY	+ DOWN
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

Collins APC-65A

SETTING	VALUE

DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	UP
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	DOWN
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	3000
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	3000
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	150mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	50mV
FLIGHT DIRECTOR VERT POLARITY	+ DOWN
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

Collins FCS-80

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN

DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	UP
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	2700
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	3000
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	150mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	150mV
FLIGHT DIRECTOR VERT POLARITY	+ DOWN
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

Collins AP-105

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	DOWN

DIP SW 5	UP
DIP SW 6	UP
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	3300
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	3300
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	100Mv
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	100mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

NOTE: *Nav and Glideslope flag require connection to a Superflag Converter such as a KDA-688 or equivalent.*

NOTE: *ILS Energize from AIU require connection to a reverse logic converter or relay for +28VDC when valid.*

Collins AP-106

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	UP

DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	2500
AUTOPILOT HEADING POLARITY	+ LEFT
AUTOPILOT SCALING – COURSE	2100
AUTOPILOT COURSE POLARITY	+ LEFT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	100mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	100mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

NOTE: *If connected to an FD-112 Flight Director, cap and stow the following pins at the Flight Director:*

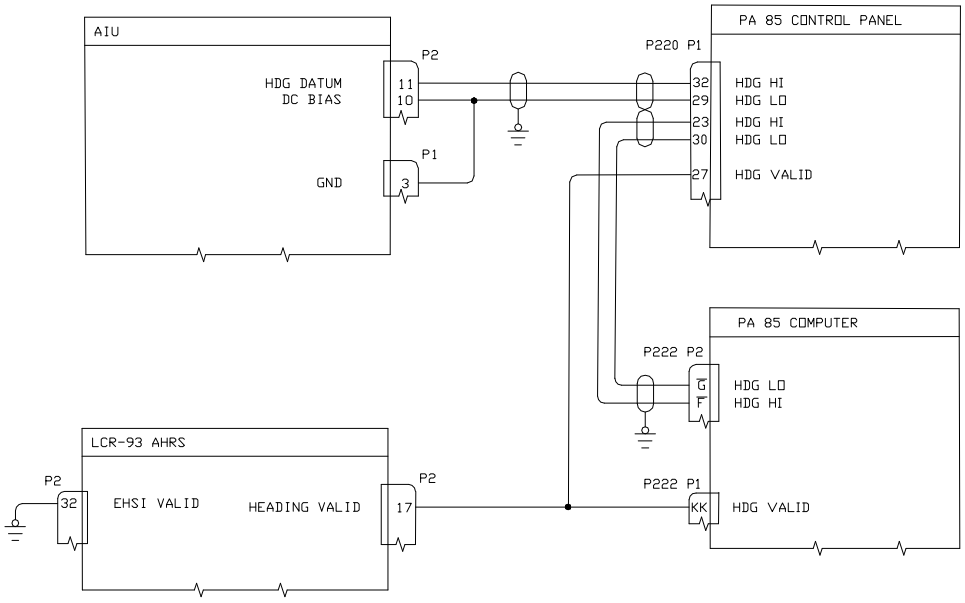
J2 pin X Heading Error X
J2 pin B Heading Error Y
J2 pin D Course Datum X
J2 pin Y Course Datum Y

Sfim PA 85

SETTING	**VALUE**
DIP SW 1	DOWN
DIP SW 2	UP
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	DOWN
DIP SW 6	N/A
DIP SW 7	N/A
DIP SW 8	N/A

DIP SW 9	UP
SLIDE SWITCH SW1	LEFT
AUTOPILOT SCALING – HEADING	3220
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	N/A
AUTOPILOT COURSE POLARITY	N/A
AUTOPILOT DATUM SCALING	N/A
FLIGHT DIRECTOR SCALING – HORIZONTAL	N/A
FLIGHT DIRECTOR HORZ POLARITY	N/A
FLIGHT DIRECTOR SCALING – VERTICAL	N/A
FLIGHT DIRECTOR VERT POLARITY	N/A
FLIGHT DIRECTOR VALID FLAG	N/A
TRANSFORMER INPUT	N/A

NOTE: *EFIS will provide Heading Datum to autopilot only.*



Sperry SPZ-200 and SPZ-500

SETTING	VALUE
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	UP
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	DOWN
DIP SW 9	UP

SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	2600
AUTOPILOT HEADING POLARITY	+ LEFT
AUTOPILOT SCALING – COURSE	2600
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	7mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	9mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X1

NOTE: *Nav and Glideslope flags must be routed through a Bendix/King KDA-688 or equivalent Super Flag Converter for proper autopilot operation.*

S-Tec 20/30/30ALT

SETTING	**VALUE**
DIP SW 1	DOWN
DIP SW 2	UP
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	DOWN
DIP SW 9	UP
SLIDE SWITCH SW1	LEFT
AUTOPILOT SCALING – HEADING	2500

AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	2500
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	N/A
FLIGHT DIRECTOR HORZ POLARITY	N/A
FLIGHT DIRECTOR SCALING – VERTICAL	N/A
FLIGHT DIRECTOR VERT POLARITY	N/A
FLIGHT DIRECTOR VALID FLAG	N/A
TRANSFORMER INPUT	N/A

S-Tec 55X Autopilot with KI-525A

SETTING	**VALUE**
DIP SW 1	DOWN
DIP SW 2	UP
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	DOWN
DIP SW 9	UP
SLIDE SWITCH SW1	LEFT
AUTOPILOT SCALING – HEADING	3300
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	1650

AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR
FLIGHT DIRECTOR SCALING – HORIZONTAL	40mV
FLIGHT DIRECTOR HORZ POLARITY	+ LEFT
FLIGHT DIRECTOR SCALING – VERTICAL	80mV
FLIGHT DIRECTOR VERT POLARITY	+ DOWN
FLIGHT DIRECTOR VALID FLAG	N/A
TRANSFORMER INPUT	N/A

S-Tec 65 Autopilot

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	DOWN
DIP SW 4	UP
DIP SW 5	DOWN
DIP SW 6	UP
DIP SW 7	UP
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	1000
AUTOPILOT HEADING POLARITY	+ RIGHT
AUTOPILOT SCALING – COURSE	1000
AUTOPILOT COURSE POLARITY	+ RIGHT
AUTOPILOT DATUM SCALING	LINEAR

FLIGHT DIRECTOR SCALING – HORIZONTAL	200mV
FLIGHT DIRECTOR HORZ POLARITY	+ RIGHT
FLIGHT DIRECTOR SCALING – VERTICAL	200mV
FLIGHT DIRECTOR VERT POLARITY	+ UP
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X2

S-Tec Magic 1500 Autopilot

SETTING	**VALUE**
DIP SW 1	UP
DIP SW 2	DOWN
DIP SW 3	UP
DIP SW 4	DOWN
DIP SW 5	UP
DIP SW 6	UP
DIP SW 7	DOWN
DIP SW 8	UP
DIP SW 9	UP
SLIDE SWITCH SW1	RIGHT
AUTOPILOT SCALING – HEADING	2200
AUTOPILOT HEADING POLARITY	+ LEFT
AUTOPILOT SCALING – COURSE	2200
AUTOPILOT COURSE POLARITY	+ LEFT
AUTOPILOT DATUM SCALING	SINE
FLIGHT DIRECTOR SCALING – HORIZONTAL	35mV
FLIGHT DIRECTOR HORZ POLARITY	+LEFT

FLIGHT DIRECTOR SCALING – VERTICAL	70mV
FLIGHT DIRECTOR VERT POLARITY	+DOWN
FLIGHT DIRECTOR VALID FLAG	HIGH
TRANSFORMER INPUT	X1

Autopilot CRS and HDG

Adjustment of the Course and Heading output are performed from the AIU Maintenance program and hardware switches. Refer to Chapter 4 for wiring diagrams.

Label	J2	Description
AC EXCITATION	9	AC DATUM REFERENCE
DC REF	10	DC DATUM REFERENCE
HDG	11	HEADING DATUM (AC OR DC)
CRS	12	COURSE DATUM (AC OR DC)

AC Heading Isolation

The Heading isolation is a center-tap transformer that isolates the Heading Datum output from P2 for autopilots that require 400Hz or 5 KHz AC HDG.

Label	P3	Description
HDG DATUM 1X	1	X1 HDG INPUT(FROM P2, PIN 11)

Label	P3	Description
HDG DATUM 2X	2	X2 HDG INPUT (FROM P2, PIN 11)
HDG DATUM LOW	3	HDG INPUT LOW
HDG OUT HI	4	HDG OUTPUT HIGH (TO AUTOPILOT)
HDG OUT CT	5	NC
HDG OUT LO	6	HDG OUTPUT LOW (TO AUTOPILOT)

AC Course Isolation

The Course isolation is a center-tap transformer that isolates the Course Datum output from P2 for autopilots that require 400Hz or 5 KHz AC CRS.

Label	P3	Description
CRS DATUM 1X	9	X1 CRS INPUT (FROM P2, PIN 12)
CRS DATUM 2X	10	X2 CRS INPUT (FROM P2, PIN 12)
CRS DATUM LOW	11	CRS INPUT LOW
CRS OUT HI	12	CRS OUTPUT HIGH (TO AUTOPILOT)
CRS OUT CT	13	NC
CRS OUT LO	14	CRS OUTPUT LOW (TO AUTOPILOT)

AC Excitation Scaling

When connecting to an autopilot that requires 400Hz Course and Heading Datum inputs, the AIU must scale the AC reference input for proper operation.

Label	P3	Description
26VAC 400HZ IN	16	AC REFERENCE INPUT
AC EXCITATION	17	SCALED AC REFERENCE TO P2, PIN 9

Navigation Output

The AIU provides a standard ±150mVDC for full scale deflection from the VOR, Localizer, or GPS output depending on the HSI source selection.

Label	J1	Description
+LEFT	40	AUTOPILOT +LEFT COMMAND
+RIGHT	39	AUTOPILOT +RIGHT COMMAND
+FLAG	47	AUTOPILOT +FLAG
-FLAG	48	AUTOPILOT -FLAG

Flight Director Interface

For those installations that require a flight director input displayed on the EFIS, the AIU can be programmed to accept the most flight director inputs. Selection of the flight director is accomplished from the AIU Ground Maintenance functions.

Flight Director Valid is connected only if the flight director computer outputs a valid flag.

The AIU Ground Maintenance functions allow the flight director scaling in mV/deg, the flight director polarity, and the flight director flag polarity (active high or low) to be configured. Refer to the Ground Functional Test (Chapter 5) and Flight Functional Test (Chapter 6) for setup of the Flight Director command bars on the EFIS.

Label	J1	Description
FD +UP	21	FLIGHT DIRECTOR +UP
FD +DN	41	FLIGHT DIRECTOR +DN
FD +LT	42	FLIGHT DIRECTOR +LEFT
FD +RT	43	FLIGHT DIRECTOR +RIGHT
FD VALID	18	FLIGHT DIRECTOR VALID

Discrete Switch Interface

The discrete switch inputs to the AIU are defined as follows:

Landing Flaps

The landing flaps discrete is used in Class-A TAWS which require flap inputs to determine if the flaps are in the landing configuration. A ground on this input signals that the flaps are in the landing configuration.

Label	J1	Description
FLAP	15	GND FOR LANDING POSITION

Low Torque

The low torque discrete is used in Class-A TAWS for helicopters to determine if the rotor torque is in a low condition for landing. A ground on this input signals that the rotor torque is low.

Label	J1	Description
LOW TORQUE	17	GND FOR LOW TORQUE

There are additional input and output discrete pins that are not defined at this time.

Label	J1	Description
DISCRETE IN 7	34	RESERVED INPUT
DISCRETE IN 8	35	RESERVED INPUT

Annunciated Switch Interface

The AIU Installation Kit contains a momentary SPST push button switch and placard for GLIDESLOPE CANCEL operation. The installer has the option of substituting this switch with an annunciated switch manufactured by Eaton or Korry if desired. Consult CFS *Field Service Notice: EFIS-II Installation* for manufactures part numbers of switches and associated hardware. The switch is wired to the EFIS system using drawings 702-045250, and 702-045251 as required.

NOTE: *Glideslope Cancel switch is only required for Class-A TAWS.*

Label	J1	Description
GLIDESLOPE CANCEL	16	GND TO INHIBIT

Program the EFIS

The EFIS must be programmed to use the AIU and associated signals. Programming the EFIS is described in the EFIS Installation Guide (Doc. 150-045264 Chapter 5).

Using the IDU Limits program, select *VOR Option* as “Installed” and select the *Analog Interface Unit* as “AIU-1 Installed.” Verify that the

other limits and boxes are correct for the aircraft that you are updating, then save the limits.txt file to a SmartMedia card for downloading to the EFIS. Perform the download function as described in the EFIS Installation Guide, Chapter 5.

WARNING!
EFIS system software must be Version 4.1A or later.

Task 4. Cable Termination

Cable connectors P1, J2, and P3 use an EMI/RFI backshell assembly to protect the signals from degradation due to external interference. To maintain this protection, the installer must properly terminate all shielded wire (especially data lines) to the backshell as described below.

1. Cut the cable to the desired length and slide the grommet into the cable.

2. Strip cable jacket from end of conductors. Take care not to cut foil or braid. Refer to Table 8 for the cable jacket strip length.

3. If using braided cable, fold braid back over cable without splitting or slicing braid. If using foil cable, cut foil to jacket and remove foil. If using cable with foil and braid, cut foil to jacket and remove foil after folding braid back over jacket.

4. Trim excess braid or drain wire to approximately 0.600 inches from end of cable jacket.

5. If using cable with braid, slide grommet under braid to end of cable jacket. If using cable with grain wire, slide grommet to end of cable jacket and fold drain wire over grommet.

6. Terminate conductors with contacts and insert contacts into rear of connector.

7. Position one half of cable clamp on cable and connector. Ensure that flange of connector is behind flange gripper of clamp and the grommet edge is positioned against inner strain-relief bar of cable clamp (Figure 5).

8. Position other half of cable clamp on top of cable and secure with attaching hardware.

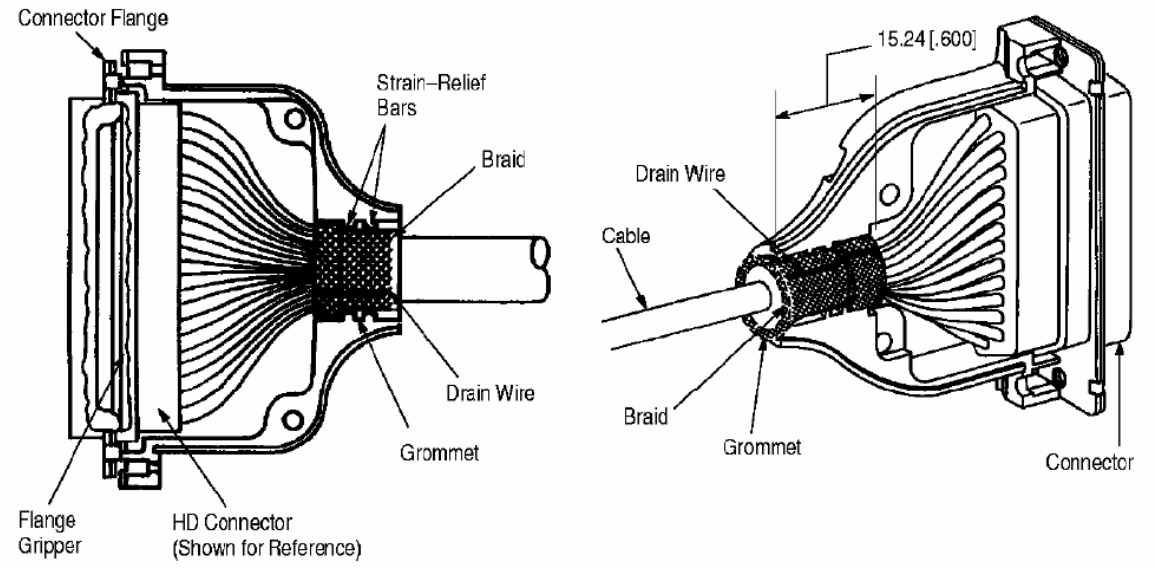


Figure 5. AIU Backshell Termination

Table 10. Cable Strip Length

POSITION	STRIP LENGTH
9 (SIZE 1)	1.00-1.50 INCHES
25 (SIZE 3)	1.30-1.60 INCHES
37 (SIZE 4)	1.40-1.70 INCHES

Figures and data for this task courtesy of Amp-Tyco/ Electronics

Chapter 3

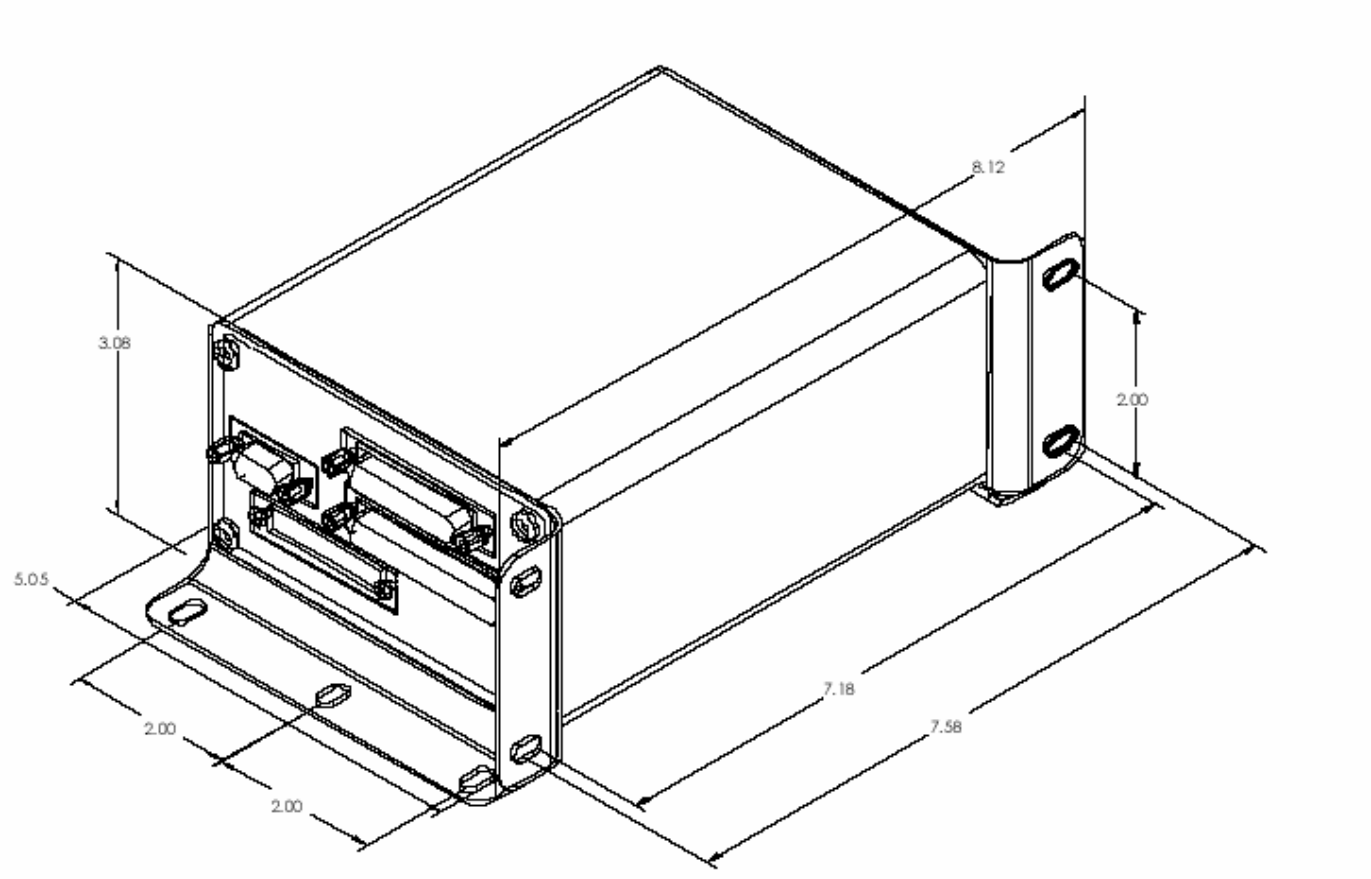
System Drawings

This section contains the mechanical and electrical drawings for the AIU. Additional drawings can be found in the appropriate vendor Installation Manuals.

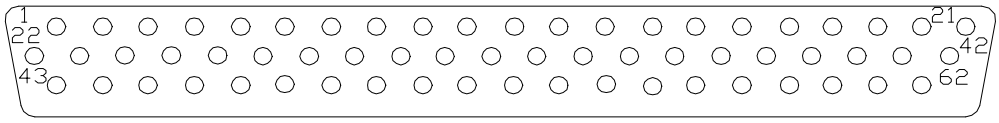
Drawings:

NOTE: *All connectors are shown viewed from the back.*

3.1 AIU Mechanical Drawings

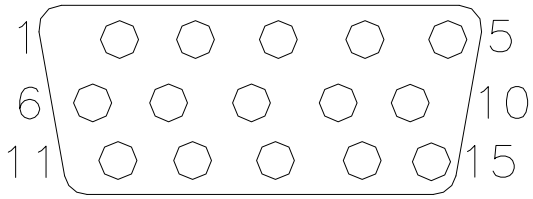


3.2 AIU P1 Connector



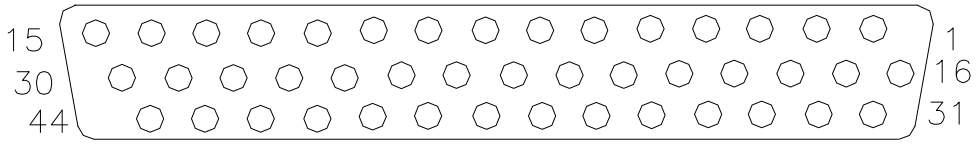
PIN	DISCRIPTION	PIN	DISCREPTION
1	COM 6 (429) RXA	32	COM 4 (232) TX
2	COM 6 (429) RXB	33	GROUND
3	GROUND	34	DISCRETE IN 7
4	COM 5 (429) RXA	35	DISCRETE IN 8
5	COM 5 (429) RXB	36	NAV 1 COMPOSITE LOW
6	GROUND	37	NAV 1 COMPOSITE HIGH
7	COM 5 (429) TXA	38	NAV 2 COMPOSITE HIGH
8	COM 5 (429) TXB	39	AUTOPILOT COMMAND +RIGHT
9	GROUND	40	AUTOPILOT COMMAND +LEFT
10	MARKER BEACON BLUE IN	41	FLIGHT DIRECTOR +DOWN
11	MARKER BEACON WHITE IN	42	FLIGHT DIRECTOR +LEFT
12	MARKER BEACON YELLOW IN	43	FLIGHT DIRECTOR +RIGHT
13	NAV 1 ILS ENERGIZE IN	44	COM 1 (232) GND
14	NAV 2 ILS ENERGIZE IN	45	GLIDESLOPE SELECT A/B
15	LANDING FLAP IN (TAWS CLASS A)	46	GROUND
16	G/S CANCEL (TAWS CLASS A)	47	AUTOPILOT NAV FLAG +
17	LOW TORQUE (HELICOPTER TAWS CLASS A)	48	AUTOPILOT NAV FLAG -
18	FLIGHT DIRECTOR VALID	49	RADAR ALTIMETER HIGH
19	NAV 2 COMPOSITE LOW	50	GROUND
20	GROUND	51	GROUND
21	FLIGHT DIRECTOR +UP	52	RADAR ALTIMETER FLAG IN
22	COM 1 (232) RX	53	GROUND
23	COM 1 (232) TX	54	NAV 1 GLIDESLOPE +UP
24	COM 2 (232) GND	55	NAV 1 GLIDESLOPE +DOWN
25	COM 2 (232) RX	56	NAV 2 GLIDESLOPE +UP
26	COM 2 (232) TX	57	NAV 2 GLIDESLOPE +DOWN
27	COM 3 (232) GND	58	NAV 1 GLIDESLOPE +FLAG
28	COM 3 (232) RX	59	NAV 1 GLIDELSOPE –FLAG
29	COM 3 (232) TX	60	NAV 2 GLIDELSOPE +FLAG
30	COM 4 (232) GND	61	NAV 2 GLIDESLOPE –FLAG
31	COM 4 (232) RX	62	GROUND

3.3 AIU P2 Connector



PIN	DISCRIPTION	PIN	DISCRIPTION
1	V-IN	9	AUTOPILOT HDG/CRS DATUM REF
2	GROUND	10	AUTOPILOT DC REFERENCE
3	ARINC 407 ADF X	11	AUTOPILOT HDG DATUM
4	ARINC 407 ADF Y	12	AUTOPILOT CRS DATUM
5	ARINC 407 ADF Z	13	ADF DC REF (KR-87 4.5VDC)
6	V-IN	14	ADF DC SIN (KR-87 SIN)
7	GROUND	15	ADF DC COS (KR-87 COS)
8	ARINC 407 ADF 26VAC REF		

3.4 AIU J3 Connector



PIN	DISCRIPTION	PIN	DISCREPTION
1	HEADING DATUM IN X1	23	GLIDESLOPE 1 +UP IN
2	HEADING DATUM IN X2	24	GLIDESLOPE 1 +DN IN
3	HEADING DATUM IN LOW	25	GLIDESLOPE 2 +UP IN
4	HEADING DATUM OUT HIGH	26	GLIDESLOPE 2 +DN IN
5	HEADING DATUM OUT CENTER	27	MARKER BEACON EXCITATION
6	HEADING DATUM OUT LOW	28	MARKER BEACON PULLUP 1
7	GROUND	29	MARKER BEACON EXCITAITON
8	GROUND	30	GLIDESLOPE +FLAG OUT
9	COURSE DATUM IN X1	31	GLIDESLOPE –FLAG OUT
10	COURSE DATUM IN X2	32	GLIDESLOPE 1 +FLAG IN
11	COURSE DATUM IN LOW	33	GLIDESLOPE 1 –FLAG IN
12	COURSE DATUM OUT HIGH	34	GLIDESLOPE 2 +FLAG IN
13	COURSE DATUM OUT CENTER	35	GLIDESLOPE 2 –FLAG IN
14	COURSE DATUM OUT LOW	36	ILS ENERGIZE OUT
15	GROUND	37	SPARE
16	26VAC 400HZ IN	38	ILS ENERGIZE 1 IN
17	AUTOPILOT EXCITATION OUT	39	SPARE
18	14VDC IN	40	ILS ENERGIZE 2 IN
19	28VDC IN	41	SPARE
20	GLIDESLOPE SELECT A/B	42	MARKER BEACON EXCITATION
21	GLIDESLOPE +UP OUT	43	MARKER BEACON PULLUP 3
22	GLIDESLOPE +DN OUT	44	MARKER BEACON PULLUP 2

3.5 AIU Wiring Diagrams

Refer to Chelton drawing 702-045250 and 702-045251 for power and EFIS interfacing.

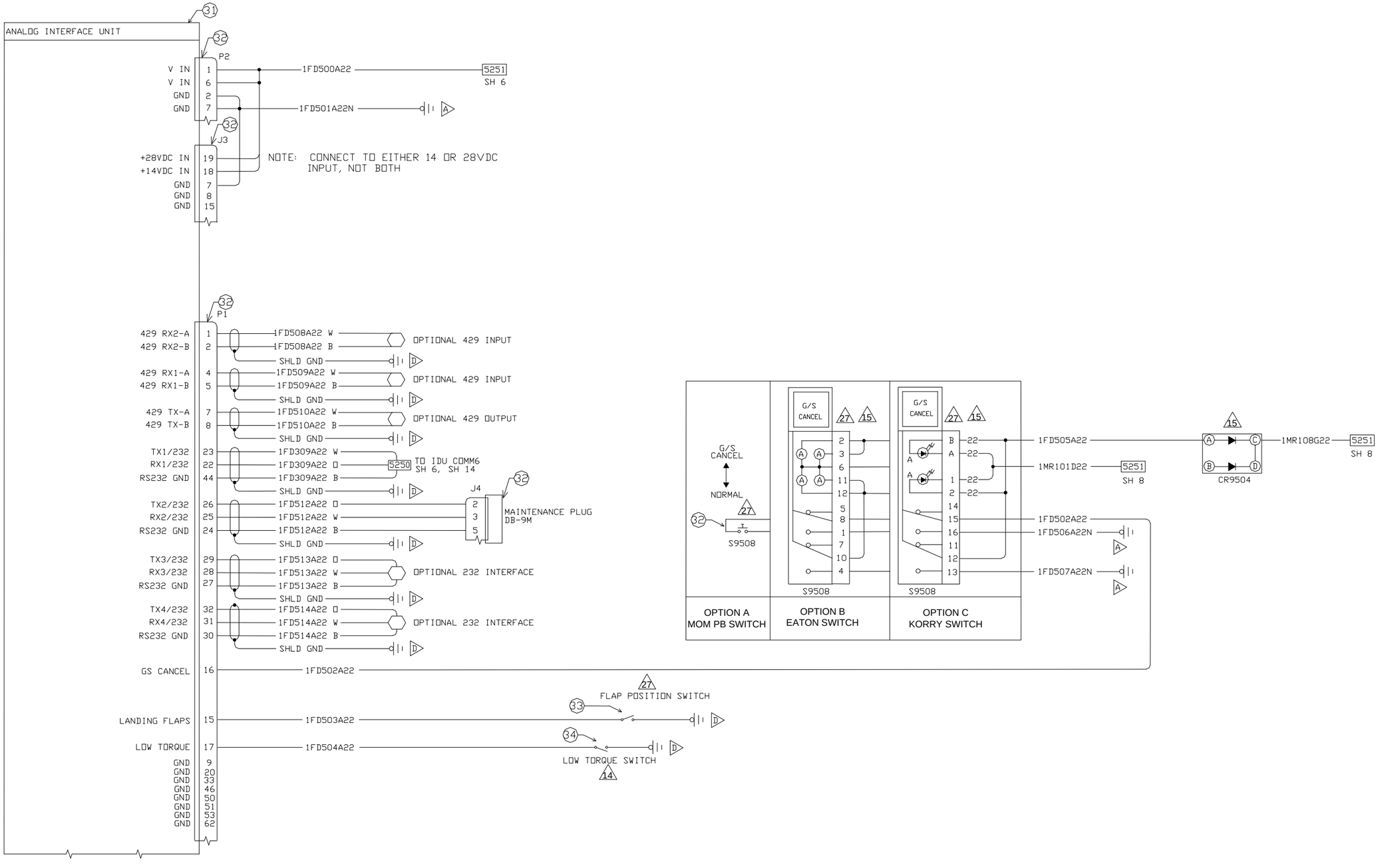
NOTES:

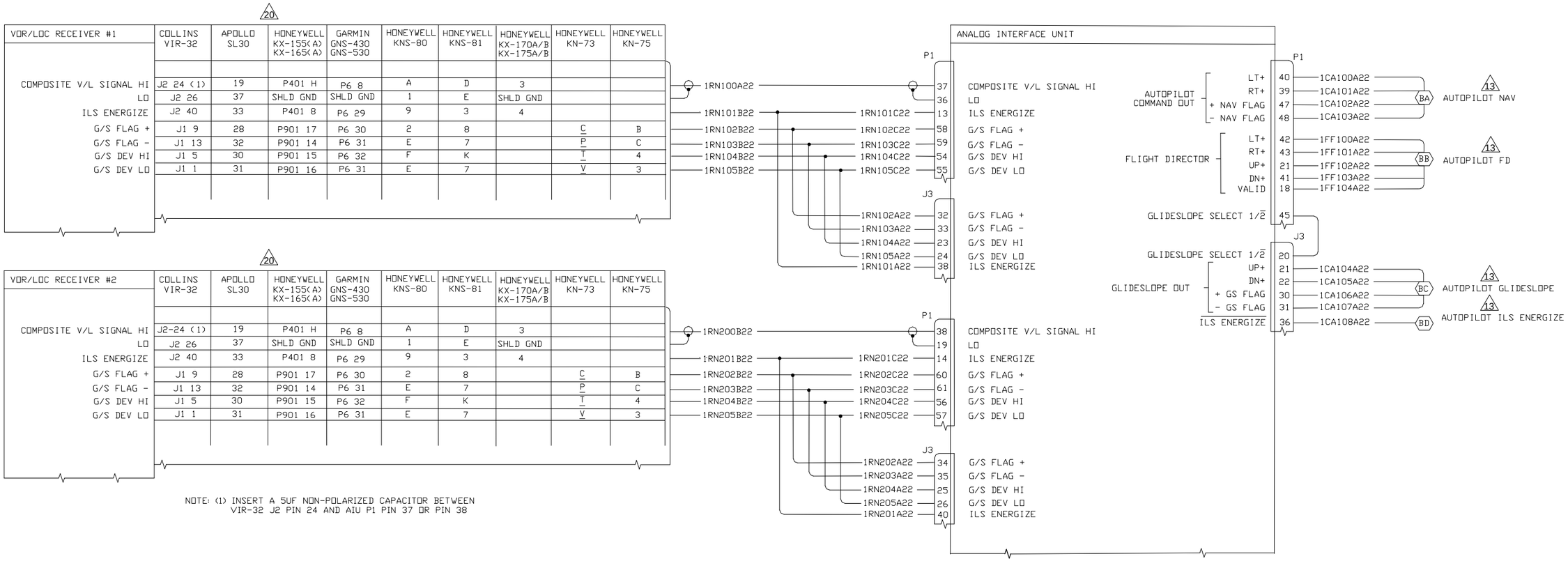
13. OPTIONAL UNIT NOT INSTALLED IN ALL CONFIGURATIONS.
14. LOW TORQUE TO BE INSTALLED ONLY ON ROTOCRAFT WITH CLASS-A TAWS
15. REFER TO CHELTON FLIGHT SYSTEMS FIELD SERVICE NOTICE: EFIS-II INSTALLATION FOR ANNUNCIATED SWITCH OPTION
19. USE EITHER XYZ OR SIN/COS ADF, NOT BOTH
20. CONNECT TO EXISTING AIRCRAFT SYSTEM AS SHOWN IN VENDOR'S MANUAL.
27. INSTALLED FOR CLASS-A TAWS ONLY

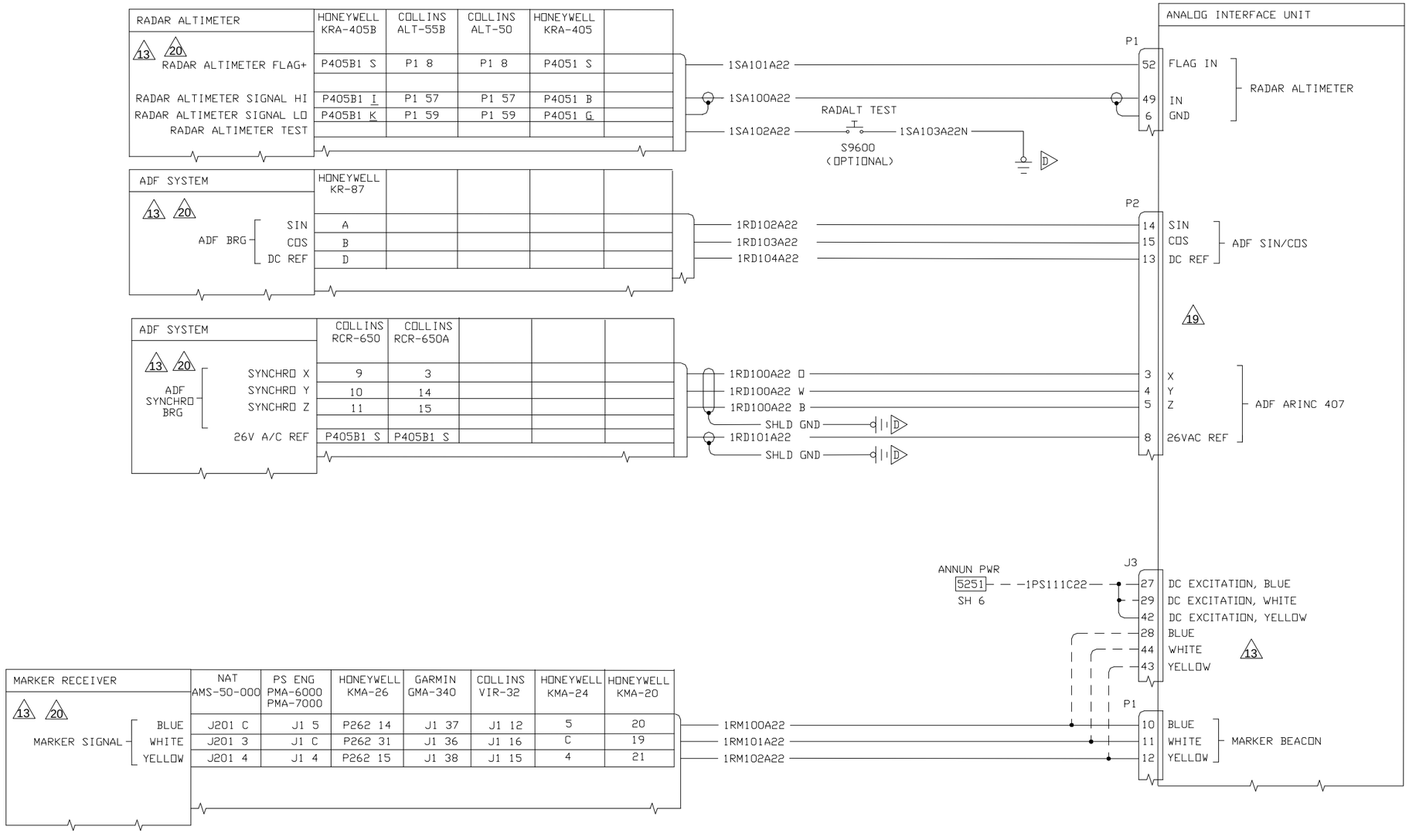
CONFIG	CLASS OF TAWS
101	AIRCRAFT, CLASS C
102	AIRCRAFT, CLASS B
103	AIRCRAFT, CLASS A
104	AIRCRAFT, CLASS A W/FLAP
105	HELICOPTER, CLASS C
106	HELICOPTER, CLASS B
107	HELICOPTER, CLASS A

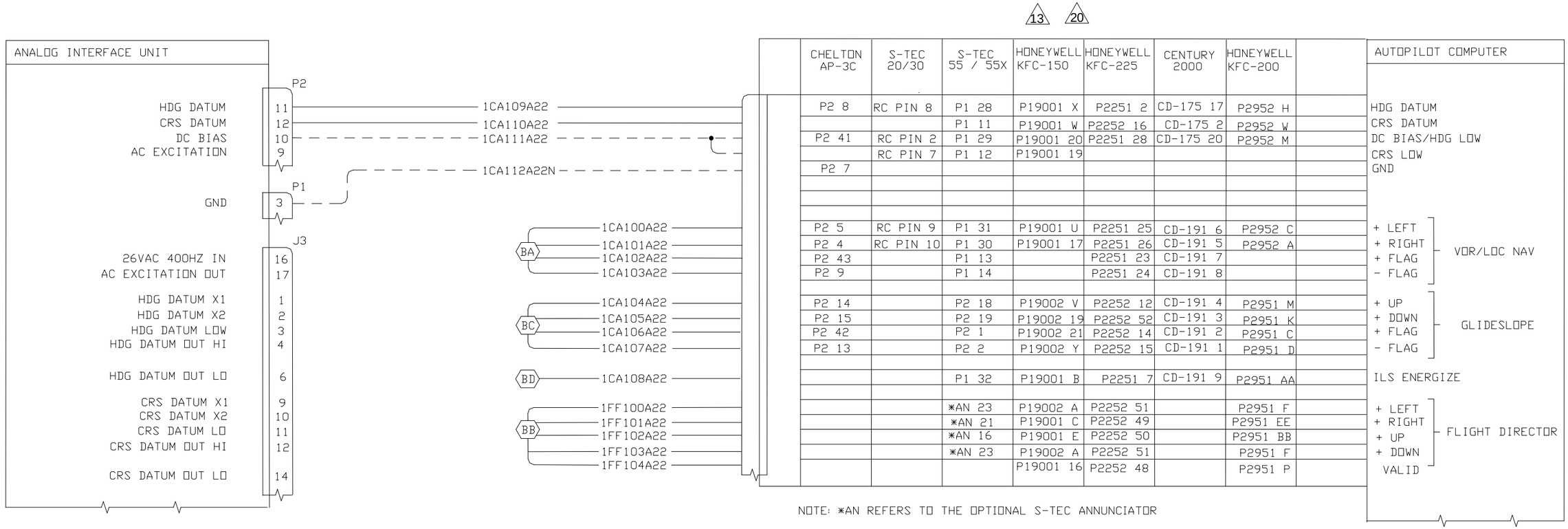
T7	T6	T5	T4	T3	T2	T1	ITEM	PART NO.	NOMENCLATURE	SPEC/VENDOR
-	-	-	1	-	-	-	34		FLAP POSITION SENSOR	
1	-	-	-	-	-	-	33		LOW TORQUE SENSOR	
1	-	-	1	1	-	-	32	455-0050	INSTALL KIT, AIU	CHELTON
1	-	-	1	1	-	-	31	453-7000	AIU-1	CHELTON

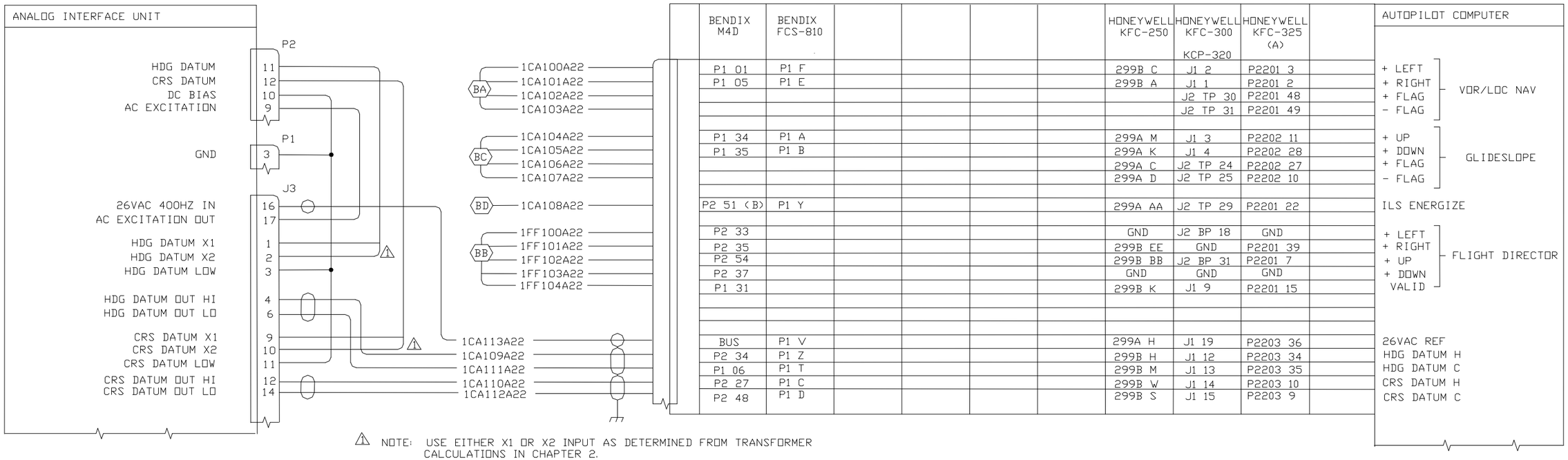
CAUTION
Refer to navigation and autopilot manufacturers Installation Manuals for proper pinout and setup of equipment in the following drawings. Interface drawings to analog equipment are for information only and may not be current.


ANALOG INTERFACE UNIT
P2
V IN 1
V IN 6
GND 2
GND 7
1FD500A22
5251
SH 6
1FD501A22N
A
J3
+28VDC IN 19
+14VDC IN 18
GND 7
GND 8
GND 15
NOTE: CONNECT TO EITHER 14 OR 28VDC INPUT, NOT BOTH
P1
429 RX2-A 1
429 RX2-B 2
1FD508A22 W
1FD508A22 B
SHLD GND
D
OPTIONAL 429 INPUT
429 RX1-A 4
429 RX1-B 5
1FD509A22 W
1FD509A22 B
SHLD GND
OPTIONAL 429 INPUT
429 TX-A 7
429 TX-B 8
1FD510A22 W
1FD510A22 B
SHLD GND
OPTIONAL 429 OUTPUT
TX1/232 23
RX1/232 22
RS232 GND 44
1FD309A22 W
1FD309A22 D
1FD309A22 B
SHLD GND
5250
TO IDU COMM6
SH 6, SH 14
J4
MAINTENANCE PLUG
DB-9M
TX2/232 26
RX2/232 25
RS232 GND 24
1FD512A22 D
1FD512A22 W
1FD512A22 B
SHLD GND
TX3/232 29
RX3/232 28
RS232 GND 27
1FD513A22 D
1FD513A22 W
1FD513A22 B
SHLD GND
OPTIONAL 232 INTERFACE
TX4/232 32
RX4/232 31
RS232 GND 30
1FD514A22 D
1FD514A22 W
1FD514A22 B
SHLD GND
OPTIONAL 232 INTERFACE
GS CANCEL 16
1FD502A22
FLAP POSITION SWITCH
LANDING FLAPS 15
1FD503A22
LOW TORQUE 17
1FD504A22
LOW TORQUE SWITCH
GND 9
GND 20
GND 33
GND 46
GND 50
GND 51
GND 53
GND 62
G/S CANCEL
NORMAL
S9508
OPTION A
MOM PB SWITCH
OPTION B
EATON SWITCH
OPTION C
KORRY SWITCH
1FD505A22
1MR101D22
5251
SH 8
1FD502A22
1FD506A22N
1FD507A22N
1MR108G22
CR9504


20
VOR/LOC RECEIVER #1
COLLINS VIR-32
APOLLO SL30
HONEYWELL KX-155(A) KX-165(A)
GARMIN GNS-430 GNS-530
HONEYWELL KNS-80
HONEYWELL KNS-81
HONEYWELL KX-170A/B KX-175A/B
HONEYWELL KN-73
HONEYWELL KN-75
COMPOSITE V/L SIGNAL HI
LO
ILS ENERGIZE
G/S FLAG +
G/S FLAG -
G/S DEV HI
G/S DEV LO
J2 24 (1) 19 P401 H P6 8 A D 3
J2 26 37 SHLD GND SHLD GND 1 E SHLD GND
J2 40 33 P401 8 P6 29 9 3 4
J1 9 28 P901 17 P6 30 2 8 C B
J1 13 32 P901 14 P6 31 E 7 P C
J1 5 30 P901 15 P6 32 F K T 4
J1 1 31 P901 16 P6 31 E 7 V 3
1RN100A22
1RN101B22
1RN102B22
1RN103B22
1RN104B22
1RN105B22
1RN101C22
1RN102C22
1RN103C22
1RN104C22
1RN105C22
1RN101A22
1RN102A22
1RN103A22
1RN104A22
1RN105A22
ANALOG INTERFACE UNIT
P1
37 COMPOSITE V/L SIGNAL HI
36 LO
13 ILS ENERGIZE
58 G/S FLAG +
59 G/S FLAG -
54 G/S DEV HI
55 G/S DEV LO
J3
32 G/S FLAG +
33 G/S FLAG -
23 G/S DEV HI
24 G/S DEV LO
38 ILS ENERGIZE
AUTOPILOT COMMAND OUT
LT+ 40 1CA100A22
RT+ 39 1CA101A22
+ NAV FLAG 47 1CA102A22
- NAV FLAG 48 1CA103A22
BA
13 AUTOPILOT NAV
FLIGHT DIRECTOR
LT+ 42 1FF100A22
RT+ 43 1FF101A22
UP+ 21 1FF102A22
DN+ 41 1FF103A22
VALID 18 1FF104A22
BB
13 AUTOPILOT FD
GLIDESLOPE SELECT 1/2 45
GLIDESLOPE SELECT 1/2 20
GLIDESLOPE OUT
UP+ 21 1CA104A22
DN+ 22 1CA105A22
+ GS FLAG 30 1CA106A22
- GS FLAG 31 1CA107A22
ILS ENERGIZE 36 1CA108A22
BC
BD
13 AUTOPILOT GLIDESLOPE
13 AUTOPILOT ILS ENERGIZE
20
VOR/LOC RECEIVER #2
COLLINS VIR-32
APOLLO SL30
HONEYWELL KX-155(A) KX-165(A)
GARMIN GNS-430 GNS-530
HONEYWELL KNS-80
HONEYWELL KNS-81
HONEYWELL KX-170A/B KX-175A/B
HONEYWELL KN-73
HONEYWELL KN-75
COMPOSITE V/L SIGNAL HI
LO
ILS ENERGIZE
G/S FLAG +
G/S FLAG -
G/S DEV HI
G/S DEV LO
J2-24 (1) 19 P401 H P6 8 A D 3
J2 26 37 SHLD GND SHLD GND 1 E SHLD GND
J2 40 33 P401 8 P6 29 9 3 4
J1 9 28 P901 17 P6 30 2 8 C B
J1 13 32 P901 14 P6 31 E 7 P C
J1 5 30 P901 15 P6 32 F K T 4
J1 1 31 P901 16 P6 31 E 7 V 3
1RN200B22
1RN201B22
1RN202B22
1RN203B22
1RN204B22
1RN205B22
1RN201C22
1RN202C22
1RN203C22
1RN204C22
1RN205C22
1RN201A22
1RN202A22
1RN203A22
1RN204A22
1RN205A22
P1
38 COMPOSITE V/L SIGNAL HI
19 LO
14 ILS ENERGIZE
60 G/S FLAG +
61 G/S FLAG -
56 G/S DEV HI
57 G/S DEV LO
J3
34 G/S FLAG +
35 G/S FLAG -
25 G/S DEV HI
26 G/S DEV LO
40 ILS ENERGIZE
NOTE: (1) INSERT A 5UF NON-POLARIZED CAPACITOR BETWEEN
VIR-32 J2 PIN 24 AND AIU P1 PIN 37 OR PIN 38


RADAR ALTIMETER
HONEYWELL KRA-405B
COLLINS ALT-55B
COLLINS ALT-50
HONEYWELL KRA-405
13 20
RADAR ALTIMETER FLAG+
P405B1 S
P1 8
P1 8
P4051 S
RADAR ALTIMETER SIGNAL HI
P405B1 I
P1 57
P1 57
P4051 B
RADAR ALTIMETER SIGNAL LO
P405B1 K
P1 59
P1 59
P4051 G
RADAR ALTIMETER TEST
1SA101A22
1SA100A22
1SA102A22
RADALT TEST
S9600
(OPTIONAL)
1SA103A22N
D
ADF SYSTEM
HONEYWELL KR-87
13 20
ADF BRG
SIN
COS
DC REF
A
B
D
1RD102A22
1RD103A22
1RD104A22
ADF SYSTEM
COLLINS RCR-650
COLLINS RCR-650A
13 20
ADF SYNCHRO BRG
SYNCHRO X
SYNCHRO Y
SYNCHRO Z
26V A/C REF
9
10
11
P405B1 S
3
14
15
P405B1 S
1RD100A22 D
1RD100A22 W
1RD100A22 B
SHLD GND
1RD101A22
SHLD GND
ANALOG INTERFACE UNIT
P1
52
49
6
FLAG IN
IN
GND
RADAR ALTIMETER
P2
14
15
13
SIN
COS
DC REF
ADF SIN/COS
19
3
4
5
8
X
Y
Z
26VAC REF
ADF ARINC 407
ANNUN PWR
5251
SH 6
1PS111C22
J3
27
29
42
28
44
43
DC EXCITATION, BLUE
DC EXCITATION, WHITE
DC EXCITATION, YELLOW
BLUE
WHITE
YELLOW
13
MARKER RECEIVER
NAT AMS-50-000
PS ENG PMA-6000 PMA-7000
HONEYWELL KMA-26
GARMIN GMA-340
COLLINS VIR-32
HONEYWELL KMA-24
HONEYWELL KMA-20
13 20
MARKER SIGNAL
BLUE
WHITE
YELLOW
J201 C
J201 3
J201 4
J1 5
J1 C
J1 4
P262 14
P262 31
P262 15
J1 37
J1 36
J1 38
J1 12
J1 16
J1 15
5
C
4
20
19
21
1RM100A22
1RM101A22
1RM102A22
P1
10
11
12
BLUE
WHITE
YELLOW
MARKER BEACON


13
20
ANALOG INTERFACE UNIT
P2
HDG DATUM 11
CRS DATUM 12
DC BIAS 10
AC EXCITATION 9
1CA109A22
1CA110A22
1CA111A22
1CA112A22N
P1
GND 3
J3
26VAC 400HZ IN 16
AC EXCITATION OUT 17
HDG DATUM X1 1
HDG DATUM X2 2
HDG DATUM LOW 3
HDG DATUM OUT HI 4
HDG DATUM OUT LO 6
CRS DATUM X1 9
CRS DATUM X2 10
CRS DATUM LO 11
CRS DATUM OUT HI 12
CRS DATUM OUT LO 14
BA
1CA100A22
1CA101A22
1CA102A22
1CA103A22
BC
1CA104A22
1CA105A22
1CA106A22
1CA107A22
BD
1CA108A22
BB
1FF100A22
1FF101A22
1FF102A22
1FF103A22
1FF104A22
CHELTON AP-3C
S-TEC 20/30
S-TEC 55 / 55X
HONEYWELL KFC-150
HONEYWELL KFC-225
CENTURY 2000
HONEYWELL KFC-200
AUTOPILOT COMPUTER
P2 8 | RC PIN 8 | P1 28 | P19001 X | P2251 2 | CD-175 17 | P2952 H | HDG DATUM
P1 11 | P19001 W | P2252 16 | CD-175 2 | P2952 W | CRS DATUM
P2 41 | RC PIN 2 | P1 29 | P19001 20 | P2251 28 | CD-175 20 | P2952 M | DC BIAS/HDG LOW
RC PIN 7 | P1 12 | P19001 19 | CRS LOW
P2 7 | GND
P2 5 | RC PIN 9 | P1 31 | P19001 U | P2251 25 | CD-191 6 | P2952 C | + LEFT
P2 4 | RC PIN 10 | P1 30 | P19001 17 | P2251 26 | CD-191 5 | P2952 A | + RIGHT
P2 43 | P1 13 | P2251 23 | CD-191 7 | + FLAG
P2 9 | P1 14 | P2251 24 | CD-191 8 | - FLAG
VOR/LOC NAV
P2 14 | P2 18 | P19002 V | P2252 12 | CD-191 4 | P2951 M | + UP
P2 15 | P2 19 | P19002 19 | P2252 52 | CD-191 3 | P2951 K | + DOWN
P2 42 | P2 1 | P19002 21 | P2252 14 | CD-191 2 | P2951 C | + FLAG
P2 13 | P2 2 | P19002 Y | P2252 15 | CD-191 1 | P2951 D | - FLAG
GLIDESLOPE
P1 32 | P19001 B | P2251 7 | CD-191 9 | P2951 AA | ILS ENERGIZE
*AN 23 | P19002 A | P2252 51 | P2951 F | + LEFT
*AN 21 | P19001 C | P2252 49 | P2951 EE | + RIGHT
*AN 16 | P19001 E | P2252 50 | P2951 BB | + UP
*AN 23 | P19002 A | P2252 51 | P2951 F | + DOWN
P19001 16 | P2252 48 | P2951 P | VALID
FLIGHT DIRECTOR
NOTE: *AN REFERS TO THE OPTIONAL S-TEC ANNUNCIATOR

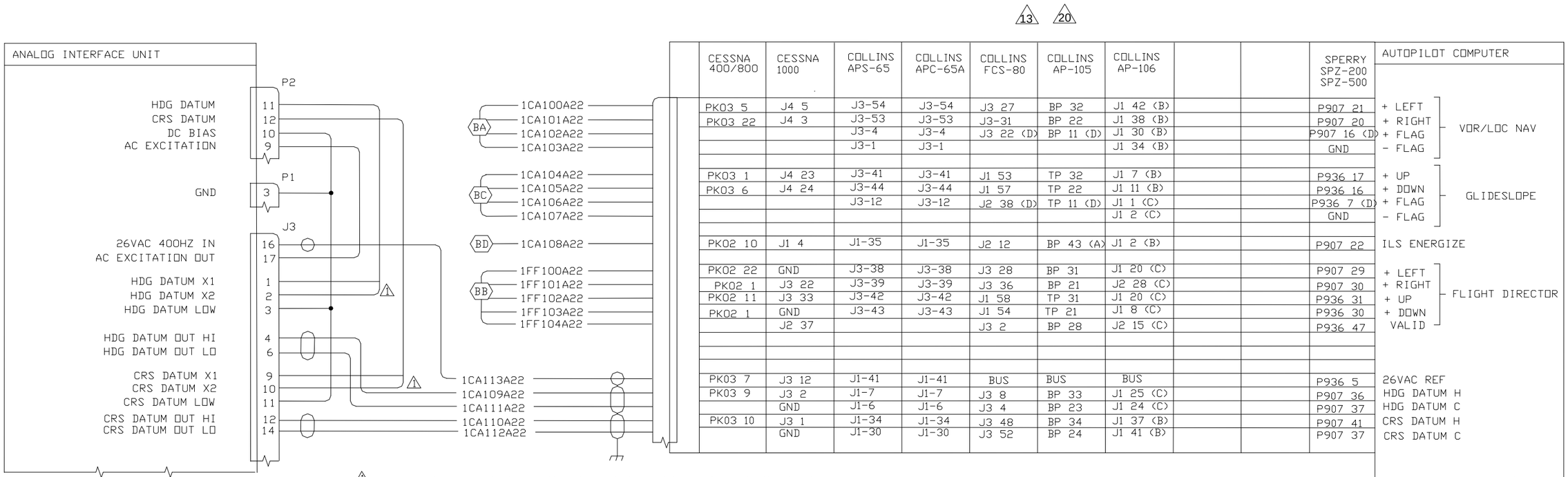


⚠1 NOTE: USE EITHER X1 OR X2 INPUT AS DETERMINED FROM TRANSFORMER CALCULATIONS IN CHAPTER 2.

(A) SEE KFC-325 AUTOPILOT INTERFACE IN CHAPTER 2 FOR ADDITIONAL INTERFACE WIRING.

(B) REQUIRES CONNECTION TO REVERSE LOGIC CONVERTER OR RELAY FOR +28VDC WHEN VALID.

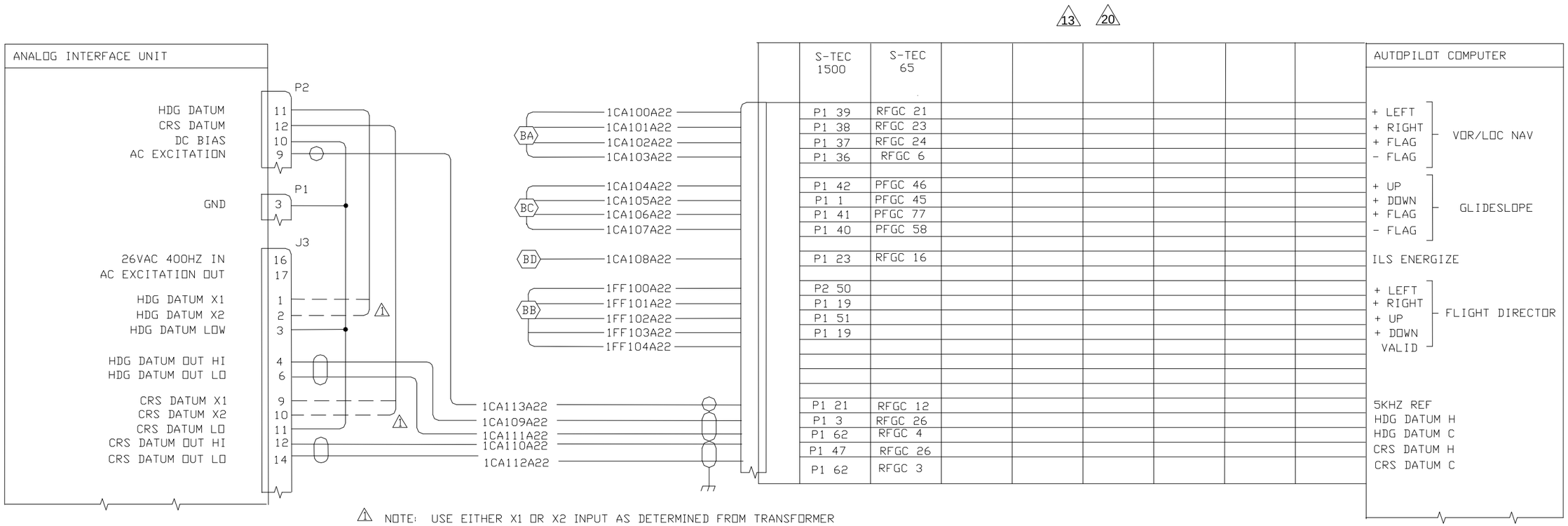
400HZ AC CRS AND HDG DATUM
AUTOPILOT INTERFACE



⚠ NOTE: USE EITHER X1 OR X2 INPUT AS DETERMINED FROM TRANSFORMER CALCULATIONS IN CHAPTER 2.

(A) REQUIRES CONNECTION TO A REVERSE LOGIC CONVERTER OR RELAY FOR +28VDC WHEN VALID.
(B) CONNECTED TO 161H-1
(C) CONNECTED TO 913K-1
(D) CONVERT TO SUPER FLAG VIA SF-40 SUPER FLAG CONVERTER OR EQUIVALENT

400HZ AC CRS AND HDG DATUM
AUTOPILOT INTERFACE



5KHZ AC CRS AND HDG DATUM
AUTOPILOT INTERFACE

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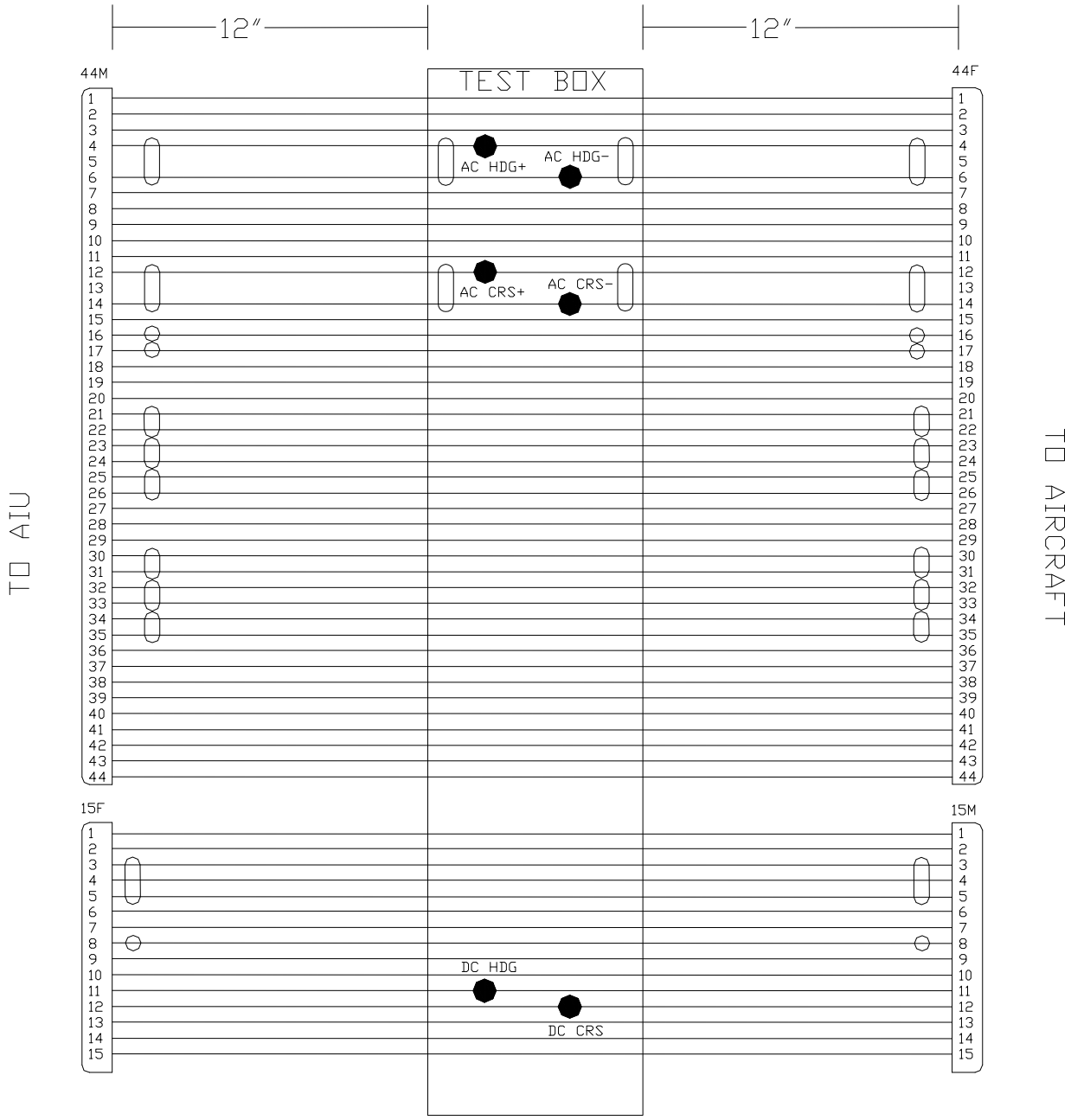
3.6 AIU Breakout Box

To facilitate ground testing of the AIU when integrating to an autopilot, the technician may wish to build a breakout box. Below is a schematic and list of part required to build the box. All parts will be obtained by the technician, and Digi-Key part numbers are provided for reference.

Parts List

QTY	PART NUMBER	DISCRIPTION
1	377-1216-ND	Enclosure, 4.6 x 3.1 x 1.87, Black Plastic, BUD
4	J320-ND	Tip Jack, 6.35mm, White, Johnson Components
2	J118-ND	Tip Jack, 6.35mm, Black, Johnson Components
1	815M-ND	D-Sub 15HD, Male Connector, NorComp
1	815F-ND	D-Sub 15HD, Female Connector, NorComp
2	970-09BP-ND	Backshell
1	844M-ND	D-Sub 44HD, Male Connector, NorComp
1	844F-ND	D-Sub 44HD, Female Connector, NorComp
2	970-25BP-ND	Backshell
59	85P-ND	Pin, Crimp, NorComp
59	85S-ND	Socket, Crimp, NorComp
		22G TEF, 22 Ga. Wire
		22G 1C TEF, 22 Ga. 1-Conductor, Shielded Wire
		22G 2C TEF, 22 Ga. 2-Conductor, Shielded Wire
		22G 3C-TEF, 22 Ga. 3-Conductor, Shielded Wire


12″
12″
TEST BOX
44M
44F
AC HDG+
AC HDG-
AC CRS+
AC CRS-
15F
15M
DC HDG
DC CRS
TO AIU
TO AIRCRAFT

Chapter 4

AIU Maintenance Utility

The AIU Maintenance Utility allows the installer to modify the analog sensor inputs to the AIU for each aircraft configuration. The program is loaded on a computer that has an RS-232 serial port or a USB to serial port adaptor.

Connect the RS-232 interface cable between the computer and the AIU Maintenance plug. The program can be started before or after power is applied to the AIU.

The Maintenance Utility allows the installer to select or perform the following functions:

- Read stored configuration
- VOR alignment (2 radios)
- LOC alignment (2 radios)
- Radar Altimeter type (ARINC-552A, ALT-50, None)
- ADF DC Sin/Cos type (KR-87 or Wulfsberg)
- Marker Beacon sense polarity
- Marker Beacon voltage threshold
- Autopilot Course datum scaling
- Autopilot Heading datum scaling
- Autopilot datum type (linear or sine)
- Autopilot Heading datum polarity
- Autopilot Course datum polarity
- Autopilot Heading datum null adjustment
- Autopilot Course datum null adjustment
- Flight Director flag polarity
- Flight Director horizontal and vertical scaling
- Flight Director horizontal polarity
- Flight Director vertical polarity
- Flight Director null adjustment

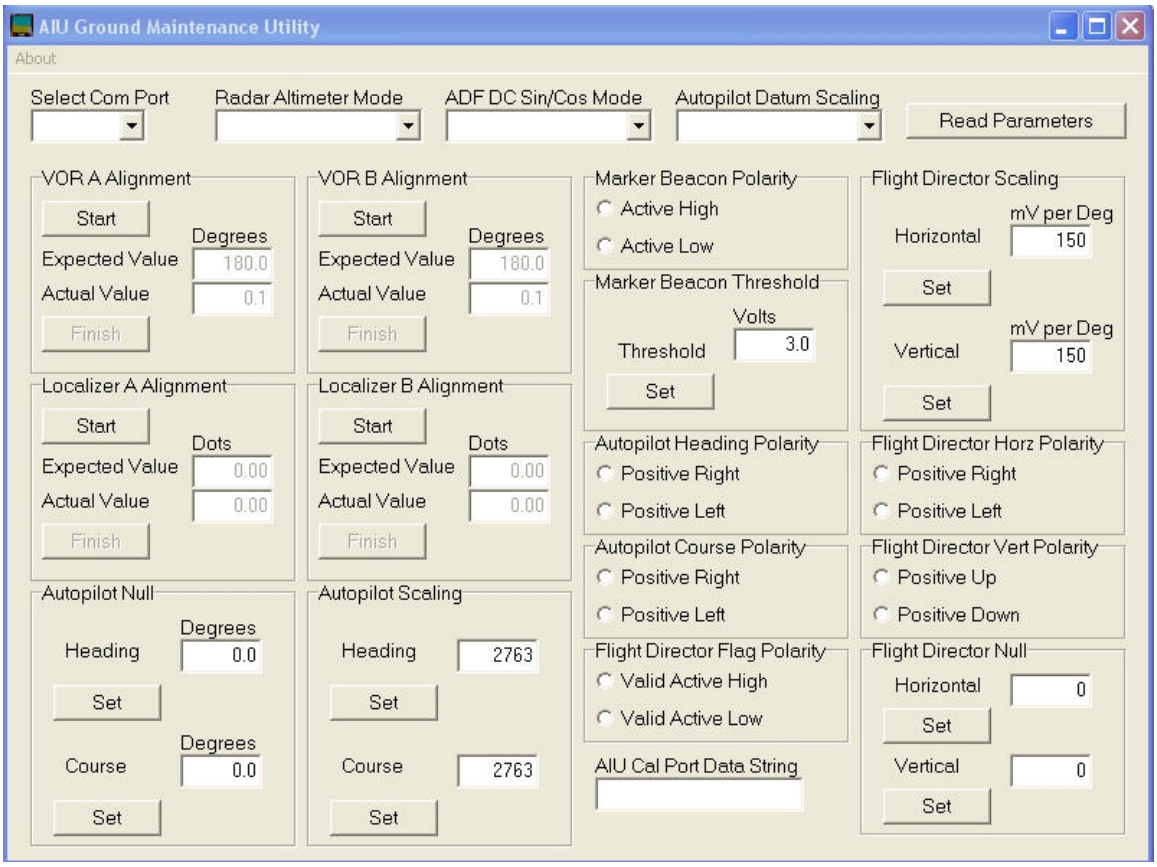


Figure 6. AIU Maintenance Utility Program

Select Com Port
Selects the computers RS-232 communication port that is connected to the AIU. The selections are:

COM1 – Computer com port 1
COM2 – Computer com port 2 (if available)
COM3 – Computer com port 3 (if available)
COM4 – Computer com port 4 (if available)

Radar Altimeter Mode
Selects the type of Radar Altimeter connected to the AIU. The selections are:

ARINC-552A – Radar Altimeter outputs a voltage scale that conforms to ARINC-552A standard
ALT-55 – Radar Altimeter outputs a voltage scale that conforms to Collins ALT-55 standard
None – No Radar Altimeter installed

ADF DC Sin/Cos Mode

Selects the type of DC ADF connected to the AIU. The selections are:

3Sin/3Cos
Disabled

Select "Disabled" for AC (ARINC407 Synchro) ADF receivers.

Autopilot Datum Scaling
Selects the type of scaling that the autopilot Course and Heading datums use. The selections are:

Linear – Linear scale from null point to 90 degrees
Sin – Sinusoidal scale from null point to 90 degrees

Read Parameters
Pressing this button will read the stored parameters in the AIU memory and display the values in the associated boxes.

VOR A Alignment
Allows the installer to align the No1 Nav VOR from the Nav radio. Alignment is described in Chapter 5.

Localizer A Alignment
Allows the installer to align the No1 Nav LOC from the Nav radio. Alignment is described in Chapter 5.

VOR B Alignment
Allows the installer to align the No2 Nav VOR from the Nav radio. Alignment is described in Chapter 5.

Localizer B Alignment
Allows the installer to align the No2 Nav LOC from the Nav radio. Alignment is described in Chapter 5.

Autopilot Scaling
Allows the installer to adjust the Heading and Course datum maximum output voltage from the AIU. This is done in conjunction with an AIU test harness as described in the Ground Test section of this chapter.

Autopilot Null
Allows the installer to adjust the Heading and Course datum null point. This allows the AIU to adjust to autopilots that have a slight amount of null point error. Adjustment is described in Chapter 6.

Marker Beacon Polarity

Selects the active polarity of the Marker Beacon output from the receiver or audio panel. *Active High* is selected when the receiver outputs a voltage above 0 to signal a Marker Beacon light. *Active Low* is selected when the receiver provides a ground to signal a Marker Beacon light. Selecting *Active Low* requires an external voltage source and pull-up resistors as shown in the wiring diagram options.

Marker Beacon Threshold
Sets the voltage for the AIU to determine a valid Marker Beacon condition. The selection of the *Marker Beacon Polarity* will determine if the valid state is above or below the threshold level.

Autopilot Heading Polarity
Selects the polarity of the AIU Heading Datum output to the autopilot. Selecting *Positive Right* will cause the AIU to send a positive DC voltage or a positive Sine angle to the autopilot when the heading bug is right of the EFIS heading indicator. Selecting *Positive Left* will cause the AIU to send a positive DC voltage or a positive Sine angle to the autopilot when the heading bug is left of the EFIS heading indicator.

Autopilot Course Polarity
Selects the polarity of the AIU Course Datum output to the autopilot. Selecting *Positive Right* will cause the AIU to send a positive DC voltage or a positive Sine angle to the autopilot when the HSI source OBS is right of the EFIS heading indicator. Selecting *Positive Left* will cause the AIU to send a positive DC voltage or a positive Sine angle to the autopilot when the HSI source OBS is left of the EFIS heading indicator.

Flight Director Flag Polarity
Selects the polarity of the Flight Director Valid Flag from an Autopilot or Flight Director Computer if applicable. Selecting *Valid Active High* will cause the AIU to send the Flight Director vertical and horizontal commands to the EFIS when the Flight Director Valid is above 3VDC. Selecting *Valid Active Low* will cause the AIU to send the Flight Director vertical and horizontal commands to the EFIS when the Flight Director Valid is below 1VDC.

Flight Director Scaling
The Horizontal scaling box allows the installer to set the value of the Flight Director horizontal signal in mV per Degree. Upon setting the value in the box, the installer will press the “Set” button below the box to store the value in the AIU memory.

The Vertical scaling box allows the installer to set the value of the Flight Director vertical signal in mV per Degree. Upon setting the value in the box, the installer will press the "Set" button below the box to store the value in the AIU memory.

Flight Director Horz Polarity
Selects the polarity of the Flight Director horizontal deviation signal to the AIU. Selecting *Positive Right* will cause the AIU to send a right deviation to the EFIS when the horizontal deviation is positive. Selecting *Positive Left* will cause the AIU to send a left deviation to the EFIS when the horizontal deviation is positive.

Flight Director Vert Polarity
Selects the polarity of the Flight Director vertical deviation signal to the AIU. Selecting *Positive Up* will cause the AIU to send an up deviation to the EFIS when the vertical deviation is positive. Selecting *Positive Down* will cause the AIU to send a down deviation to the EFIS when the vertical deviation is positive.

Flight Director Null
The Horizontal null box allows the installer to center the horizontal deviation on the EFIS when the Flight Director horizontal command is centered. Upon selecting the value in the box, the installer will press the "Set" button below the box to store the value in the AIU memory.

The Vertical null box allows the installer to center the vertical deviation on the EFIS when the Flight Director vertical command is centered. Upon selecting the value in the box, the installer will press the "Set" button below the box to store the value in the AIU memory.

AIU Cal Port Data String
The data displayed in this box is real-time from the AIU.

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Chapter 5

Ground Functional Test

		PASS	FAIL

1.0 PURPOSE OF TEST:

1.1 The procedures defined in this plan will demonstrate the proper operation of the AIU as installed on aircraft.

2.0 TEST EQUIPMENT REQUIRED:

2.1 Navigation Flight Line Tester IFR-401 or equivalent
Digital Multi-Meter
Laptop computer with AIU Maintenance program
RS-232 Serial cable
Autopilot tester or breakout box as required
AIU breakout box as required (See Chapter 3)
Pilots Guide and Reference

3.0 AIU STRUCTURAL TEST:

3.1 Structure test of AIU mounting shelf as described in Chapter 2, Task 2. _____ _____

4.0 AIU SWITCH SETTINGS:

4.1 Verify settings for S1 and S2 positions 1 and 2 are correct for AC or DC operations as described in Chapter 2, Autopilot Interface. _____ _____

4.2 Verify settings for S2 positions 3 thru 5 are correct for Heading Datum Gain as described in Chapter 2, Autopilot Interface. _____ _____

4.3 If required, verify settings for S2 positions 6 thru 8 are correct for Course Datum Gain as described in Chapter 2, Autopilot Interface. _____ _____

5.0 AIU WIRING TEST:

		PASS	FAIL

5.1 Do not connect any equipment connectors until the following steps have been completed, prior to applying power to the AIU.

5.2 Verify the wiring. Each wire should be continuity checked as indicated on drawing 702-045250 and 702-045251. _____ _____

5.3 All shield wire, shielded twisted pairs and shielded twisted triple cables should be checked for shorts to the shield. _____ _____

5.4 Apply aircraft 14 or 28 Volt DC power (as applicable). Place the EFIS Master or Avionics Master switch to ON.

Verify that the proper voltage is on the proper pin.

AIU	Connector	P2	Pins 1,6	_____	_____
AIU	Connector	J3	Pin 18 or 19	_____	_____

5.5 Place the EFIS Master or Avionics Master switch to OFF and remove aircraft 14 or 28V DC power.

5.6 At this time, install the AIU connector and push in all related circuit breakers.

6.0 POWER UP EFIS SYSTEM TEST:

NOTE: Verify that all EFIS circuit breakers are pushed in.

6.1 Apply aircraft 14 or 28 Volt DC power (as applicable). Place the EFIS Master or Avionics Master switch to ON.

6.2 Allow the EFIS to perform the self-test routine and verify the IDUs are displaying the correct page. _____ _____

6.3 Verify that the "AUX SENSOR" flag is not present on either the PFD or MFD(s). _____ _____

NOTE: Depending on aircraft location, other flags such as "NO GPS" might be present on the EFIS. Determine the cause of any additional flags and correct accordingly.

6.4 From the MFD, press the *MENU* button then select "FAULTS" menu. Verify that the "AIU" is labeled "OK." _____ _____

		PASS	FAIL

6.5 Press the *MENU* button again to exit the submenu.

7.0 NAV1 TEST:

7.1	If installed, tune the No1 Nav receiver to the Flight Line tester VOR test frequency.	_____	_____
7.2	Turn on the test set and select the VOR output with a signal level of -100dBm.	_____	_____
7.3	Select the "HSI" format on the MFD.	_____	_____
7.4	Turn on the RMI function on the MFD.	_____	_____
7.5	Set the HSI source to Nav 1.	_____	_____
7.6	Verify that the green "HSI: NAV1" flag is displayed on the lower left-hand corner of the PFD and MFD(s).	_____	_____
7.7	Connect Laptop computer with AIU Maintenance program to AIU Maintenance connector. Turn on computer and start the program.		
7.8	Verify that the VOR needle on the HSI is not present (flagged).	_____	_____
7.9	Increase the test set signal level until the Nav1 needle is displayed.	_____	_____
7.10	Set the VOR dial on the test set to the aircraft heading on the EFIS, and set the "VOR OBS" to the aircraft heading. Verify CDI needle is within a dot of center.	_____	_____
7.11	Set the VOR dial on the test set to a heading of 180 and direction to TO. Select the "VOR OBS," and then rotate the right-hand encoder until the OBS is at 180 degrees. Verify the needle on the HSI moves to 180 ±3 degrees.	_____	_____
7.12	Press the VOR A Alignment *START* button in the AIU Maintenance program. Highlight the "Expected Value" box and type 180.0. Highlight the "Actual Value" box and type the value of the CDI needle into the box. Press the *FINISH* button and verify the CDI needle is centered.	_____	_____

		PASS	FAIL
7.13	Set the VOR direction to FROM and verify the CDI needle pointer is pointing to 360 degrees and the needle is centered.	_____	_____

7.14	Set the VOR dial on the test set to a heading of 90.0 and direction to TO. Select the "VOR OBS," and then rotate the right-hand encoder until the OBS is at 90 degrees. Verify the needle on the HSI moves to 90 ±3 degrees.	_____	_____
7.15	Set the VOR dial on the test set to a heading of 360.0. Select the "NAV OBS," and then rotate the right-hand encoder until the OBS is at 360 degrees. Verify the needle on the HSI moves to 360 ±3 degrees.	_____	_____
7.16	Set the VOR dial on the test set to a heading of 270.0. Select the "VOR OBS," and then rotate the right-hand encoder until the OBS is at 270 degrees. Verify the needle on the HSI moves to 270 ±3 degrees.	_____	_____
7.17	Set the No1 Nav receiver to the test set ILS frequency. Tune the test set to the ILS frequency and select a 0 degree LOC and 0 degree GS.	_____	_____
7.18	Verify the CDI needle is centered and the GS bar is at 0 on the HSI. Verify CDI is centered on the flight path marker and GS bar is at 0 on the PFD.	_____	_____
7.19	Press the Localizer A Alignment *START* button in the AIU Maintenance program. Highlight the "Expected Value" box and type 0.00. Highlight the "Actual Value" box and type in the CDI deviation in dot (Right =+) as displayed on the HSI. Press the *FINISH* button and verify the CDI needle is centered.	_____	_____
7.20	Set the test set for a standard deflection right (0.093DDM) LOC and verify the CDI needle on the HSI is deflected between 1.0 and 1.2 Dot right. Verify the CDI needle is between 1.0 and 1.2 Dot right of the flight path marker on the PFD.	_____	_____

		PASS	FAIL

7.21	Set the test set for a full scale deflection right (0.155DDM) LOC and verify the CDI needle on the HSI is deflected between 1.8 and 2.0 Dots right. Verify the CDI is between 1.8 and 2.0 Dots right of the flight path marker on the PFD.	_____	_____
7.22	Set the test set to a 90 Hz only tone LOC and verify the CDI needle on the HSI and the CDI needle on the PFD are removed.	_____	_____
7.23	Set the test set for a standard deviation left (0.093DDM) LOC and verify the CDI needle on the HSI is deflected between 1.0 and 1.2 Dots left. Verify the CDI needle is between 1.0 and 1.2 Dots left of the flight path marker on the PFD.	_____	_____
7.24	Set the test set for a full scale deflection left (0.155DDM) LOC and verify the CDI needle on the HSI is deflected between 1.8 and 2.0 Dots left. Verify the CDI needle is between 1.8 and 2.0 Dots left of the flight path marker on the PFD.	_____	_____
7.25	Set the test set to a 150 Hz only tone and verify the CDI needle on the HSI and the CDI needle on the PFD are removed.	_____	_____
7.26	Set the test set to 0 degrees LOC. Verify the CDI needle on the HSI is centered. Verify the CDI needle is centered on the flight path marker on the PFD.	_____	_____
7.27	Set the test set for a standard deviation down (0.091DDM) GS and verify the GS bar on the HSI is one-dot down. Verify the GS bar is one dot down on the PFD.	_____	_____
7.28	Set the test set for a full scale deviation down (0.175DDM) GS and verify the GS bar on the HSI is full deflection down. Verify the GS bar is two dots down on the PFD.	_____	_____
7.29	Set the test set to a 150 Hz only tone GS and verify that the GS bar is removed on the HSI and the GS bar is removed from the PFD.	_____	_____
7.30	Set the test set for a standard deviation up (0.091DDM) GS and verify the GS bar on the HSI is one-dot up. Verify the GS bar is one dot up on the PFD.	_____	_____
		PASS	**FAIL**

7.31	Set the test set for a full scale deviation up (0.175DDM) GS and verify the GS bar on the HSI is full deflection up. Verify the GS bar is two dots up on the PFD.	_____	_____
7.32	Set the test set to a 90 Hz only tone GS and verify that the GS bar is removed on the HSI and the GS bar is removed on the PFD.	_____	_____
7.33	Reset the test set to a centered deflection (0DDM) GS and verify that the GS bar on the HSI is centered and the CDI bar on the PFD is centered.	_____	_____

8.0 NAV2 TEST:

8.1	If installed, tune the No2 Nav receiver to the Flight Line tester VOR test frequency	_____	_____
8.2	Turn on the test set and select the VOR output with a signal level of -100dBm.	_____	_____
8.3	Set the HSI to Nav 2.	_____	_____
8.4	Verify that the green “HSI: NAV2” flag is displayed on the lower left-hand corner of the PFD and MFD(s).	_____	_____
8.5	Verify that the VOR needle on the HSI is flagged.	_____	_____
8.6	Increase the test set signal level until the Nav2 needle is displayed.	_____	_____
8.7	Set the VOR dial on the test set to the aircraft heading on the EFIS. Select the “VOR OBS,” and then rotate the right-hand encoder until the OBS is in line with aircraft heading. Verify CDI needle is within a dot of center.	_____	_____
8.8	Set the VOR dial on the test set to a heading of 180 and direction to TO. Select the “VOR OBS,” and then rotate the right-hand encoder until the OBS is at 180 degrees. Verify the needle on the HSI moves to 180 ±3 degrees.	_____	_____

		PASS	FAIL

8.9	Press the VOR B Alignment *START* button in the AIU Maintenance program. Highlight the "Expected Value" box and type 180.0. Highlight the "Actual Value" box and type the value of the CDI needle into the box. Press the *FINISH* button and verify the CDI needle is centered.	_____	_____
8.10	Set the VOR direction to FROM and verify the CDI needle pointer is pointing to 360 degrees and the needle is centered.	_____	_____
8.11	Set the VOR dial on the test set to a heading of 90.0 and direction to TO. Select the "VOR OBS," and then rotate the right-hand encoder until the OBS is at 90 degrees. Verify the needle on the HSI moves to 90 ±3 degrees.	_____	_____
8.12	Set the VOR dial on the test set to a heading of 360.0. Select the "VOR OBS," and then rotate the right-hand encoder until the OBS is at 360 degrees. Verify the needle on the HSI moves to 360 ±3 degrees.	_____	_____
8.13	Set the VOR dial on the test set to a heading of 270.0. Select the "VOR OBS," and then rotate the right-hand encoder until the OBS is at 270 degrees. Verify the needle on the HSI moves to 270 ±3 degrees.	_____	_____
8.14	Set the No2 Nav receiver to the test set ILS frequency. Tune the test set to the ILS frequency and select a 0 degree LOC and 0 degree GS.	_____	_____
8.15	Verify the CDI needle is centered and the GS bar is at 0 on the HSI. Verify CDI needle is centered to the flight path marker and the GS bar is at 0 on the PFD.	_____	_____
8.16	Press the Localizer B Alignment *START* button in the AIU Maintenance program. Highlight the "Expected Value" box and type 0.00. Highlight the "Actual Value" box and type in the CDI deviation in dot (Right =+) as displayed on the HSI. Press the *FINISH* button and verify the CDI needle is centered.	_____	_____

		PASS	FAIL

8.17	Set the test set for a standard deflection right (0.093DDM) LOC and verify the CDI needle on the HSI is deflected between 1.0 and 1.2 Dot right. Verify the CDI needle is between 1.0 and 1.2 Dot right of the flight path marker on the PFD.	_____	_____
8.18	Set the test set for a full scale deflection right (0.155DDM) LOC and verify the CDI needle on the HSI is deflected between 1.8 and 2.0 Dots right. Verify the CDI needle is between 1.8 and 2.0 Dots right of the flight path marker on the PFD.	_____	_____
8.19	Set the test set to a 90 Hz only tone LOC and verify the CDI needle on the HSI and the CDI needle on the PFD are removed.	_____	_____
8.20	Set the test set for a standard deviation left (0.093DDM) LOC and verify the CDI needle on the HSI is deflected between 1.0 and 1.2 Dot left. Verify the CDI needle is between 1.0 and 1.2 Dot left of the flight path marker on the PFD.	_____	_____
8.21	Set the test set for a full scale deflection left (0.155DDM) LOC and verify the CDI needle on the HSI is deflected between 1.8 and 2.0 Dots left. Verify the CDI needle is between 1.8 and 2.0 Dots left of the flight path marker on the PFD.	_____	_____
8.22	Set the test set to a 150 Hz only tone and verify the CDI needle on the HSI and the CDI needle on the PFD are removed.	_____	_____
8.23	Set the test set to 0 degrees LOC. Verify the CDI needle on the HSI is centered. Verify the CDI needle is centered on the flight path marker on the PFD.	_____	_____
8.24	Set the test set for a standard deviation down (0.091DDM) GS and verify the GS bar on the HSI is one-dot down. Verify the GS bar is one dot down on the PFD.	_____	_____
8.25	Set the test set for a full scale deviation down (0.175DDM) GS and verify the GS bar on the HSI is full deflection down. Verify the GS bar is two dots down on the PFD.	_____	_____
8.26	Set the test set to a 150 Hz only tone GS and verify that the GS bar is removed on the HSI and PFD.	_____	_____
		PASS	**FAIL**

8.27	Set the test set for a standard deviation up (0.091DDM) GS and verify the GS bar on the HSI is one-dot up. Verify the GS bar is one dot up on the PFD.	_____	_____
8.28	Set the test set for a full scale deviation up (0.175DDM) GS and verify the GS bar on the HSI is full deflection up. Verify the GS bar is two dots up on the PFD.	_____	_____
8.29	Set the test set to a 90 Hz only tone GS and verify that the GS bar on the HSI and PFD are removed.	_____	_____
8.30	Reset the test set to a centered deflection (0DDM) GS and verify that the GS bar on the HSI and PFD are centered.	_____	_____

9.0 MARKER BEACON TEST:

9.1	Set the polarity of the Marker Beacon by selecting the "Active High" or "Active Low" buttons on the AIU Maintenance program. "Active High" is used when a Marker Beacon receiver outputs a voltage to signal a valid beacon condition. "Active Low" is used when a Marker Beacon receiver outputs a ground to signal a valid beacon condition. Consult the Marker Beacon receiver or Audio Panel Installation Manual for details.		
9.2	Set the threshold of the Marker Beacon by highlighting the "Volts" box on the AIU Maintenance program and setting the threshold to determine a valid condition. If Marker Beacon polarity is set to "Active High," any voltage above this level will be considered a valid condition. If Marker Beacon polarity is set to "Active Low," any voltage below this level will be considered a valid condition. Default value is 3.0 Volts.		
9.3	If the Marker Beacon is interfaced with the AIU, tune the Nav test set to the Marker Beacon frequency.		
9.4	Select the 400 Hz output and verify that the blue circle with "O" on the lower-center of the PFD.	_____	_____
9.5	Select the 1300 Hz output and verify that the amber circle with "M" on the lower-center of the PFD.	_____	_____
9.6	Select the 3000 Hz output and verify that the white circle with "I" on the lower-center of the PFD is.	_____	_____
		PASS	**FAIL**

10.0 ADF TEST:

10.1	Select the “MAP” format.	_____	_____
10.2	If interfaced with a DC ADF output, select the 3Sin/3Cos mode in the AIU Maintenance program.	_____	_____
	NOTE: ARINC-407 XYZ ADF does not require a selection.		
10.3	Tune the ADF receiver to three or four different stations and verify that the ADF needle on the MFD RMI points in the direction of the station within 5 degrees.	_____	_____
10.4	Press the test button on the ADF receiver as applicable and verify the ADF needle on the HSI performs the test function as described in the receiver installation/maintenance manual.	_____	_____
10.5	Tune the ADF receiver to an off frequency or turn off the ADF receiver and verify that the ADF needle on the RMI is removed.	_____	_____

11.0 RADAR ALTIMETER TEST:

11.1	Select the type of Radar Altimeter from the “Radar Altimeter Mode” pull-down box on the AIU Maintenance program.		
11.2	Verify that the altitude next to the flight path marker on the PFD is reading “0R.”	_____	_____
11.3	Press the Radar Altimeter test button and verify that the altitude next to the flight path marker on the PFD increases to the test altitude as detailed in the test section of the Radar Altimeter installation/maintenance manual.	_____	_____
11.4	Release the Radar Altimeter test button and verify that the altitude next to the flight path marker on the PFD returns to “0R.”	_____	_____

12.0 HEADING DATUM TEST:

12.1	Ensure the Heading and Attitude sources for the autopilot are valid and level.	_____	_____

		PASS	FAIL

12.2	Ensure that there is no Flight Plan active and the Heading Bug is deactivated on the EFIS.	_____	_____
12.3	Place the autopilot in the Heading mode and verify the autopilot does not command a roll.	_____	_____
	NOTE: EFIS heading is measured in 1° increments. It may be necessary to reposition the aircraft to null the Heading Bug.		
12.3.1	If the autopilot commands a roll, adjust the AUTOPILOT NULL - HEADING in the AIU Maintenance program to center the command.	_____	_____
12.4	Connect a DMM across the Heading Datum output of the AIU and measure the voltage.		
12.4.1	Activate the EFIS Heading Bug and rotate the bug to 30° Left and Right of null. Voltages measured from the AIU should match the values from the HSI as described in Chapter 2.	_____	_____
12.4.2	If the measured values are different, adjust the AUTOPILOT SCALING – HEADING in the AIU Maintenance program until the values match.	_____	_____

13.0 COURSE DATUM TEST:

13.1	On the EFIS MFD, select the HSI page.		
13.2	Press the OBS button on the EFIS and select a Nav source (Nav1 or Nav2). Place the autopilot in the Nav mode.		
13.3	Tune the Nav Test Set to the default VOR frequency and set the VOR radial to the aircraft heading.		
13.3	Place the appropriate Nav receiver in the VOR mode and tuned to the Test Set VOR frequency. Verify the Nav flag is valid.	_____	_____
13.4	Rotate the right-hand encoder on the EFIS until the Course pointer is nulled (straight up) and the CDI needle is centered. Verify the autopilot does not command a roll.	_____	_____

		PASS	FAIL

NOTE: EFIS course is measured in 1° increments. It may be necessary to reposition the aircraft to null the Course Datum.

13.4.1	If the autopilot commands a roll, adjust the AUTOPILOT NULL – COURSE in the AIU Maintenance program to center the drive.	_____	_____
13.5	Connect a DMM across the Course Datum output of the AIU and measure the voltage.	_____	_____
13.5.1	Rotate the Nav OBS on the EFIS to 50° left and right of null. Voltages measured from the AIU should match the values from the HSI as described in Chapter 2.	_____	_____
13.5.2	If the measured values are different, adjust the AUTOPILOT SCALING – COURSE in the AIU Maintenance program until the values match.	_____	_____

14.0 NAVIGATION TEST:

14.1	Rotate the right-hand encoder until the Course pointer is centered.		
14.2	Verify the CDI on the HSI is centered on the EFIS.	_____	_____
14.3	Place the autopilot in Nav mode and verify the autopilot has captured the Nav signal.	_____	_____
14.4	Tune the 2nd Nav source (if installed) to an unused VOR frequency.	_____	_____
14.5	Select the 2nd Nav source on the EFIS and verify the CDI bar on the PFD and MFD disappear and the autopilot deactivates the Nav capture.	_____	_____
14.6	Tune the Nav Test Set to the default ILS frequency and set the LOC and GS deviations to capture the ILS as described in the autopilot Installation/Maintenance manual.	_____	_____
14.7	Tune the Nav radio to the Nav Test Set default ILS frequency.	_____	_____

		PASS	FAIL

14.8	Adjust the Nav Test Set LOC deviation until the autopilot captures the LOC. Verify the LOC deviation bar on the PFD and MFD are displayed.	_____	_____
14.9	Adjust the Nav Test Set GS deviation until the autopilot captures the GS. Verify the GS deviation bar on the PFD and MFD are displayed.	_____	_____
14.10	Adjust the Nav Test Set LOC and GS deviation and verify the LOC and GS deviation bars on the PFD and MFD and the autopilot follow the adjustments.	_____	_____
14.11	Select the 1st Nav source on the EFIS and verify the LOC and GS deviation bars on the PFD and MFD are removed, and the autopilot deactivates the ILS capture.	_____	_____

15.0 FLIGHT DIRECTOR HORIZONTAL TEST: (OPTIONAL)

15.1	Place the EFIS OBS in GPS mode and activate the Heading Bug.		
15.1.1	Place the autopilot in Heading mode.	_____	_____
15.2	Verify the EFIS Heading Bug is centered and the autopilot does not command a roll drive.	_____	_____
	NOTE: EFIS heading is measured in 1° increments. It may be necessary to reposition the aircraft to null the Heading Bug.		
15.3	Select the Flight Director on the EFIS PFD and verify the horizontal and vertical command bars are centered on the Flight Path Marker (FPM).	_____	_____
15.3.1	If the horizontal command bar is not centered, adjust the FLIGHT DIRECTOR NULL – HORIZONTAL until the bar is centered.	_____	_____
15.4	Set the FLIGHT DIRECTOR SCALING – HORIZONTAL to 150 mV/Deg in the AIU Maintenance program.	_____	_____
15.5	Adjust the EFIS Heading Bug until the H-bar on the PFD stops moving.	_____	_____
		PASS	**FAIL**

15.6	Adjust the EFIS Heading Bug to the left roll limit of the autopilot (typically 20-25°).		
15.7	Adjust the FLIGHT DIRECTOR SCALING – HORIZONTAL until the horizontal command bar on the PFD is at full-scale deflection.	_____	_____
15.8	Slowly adjust the Heading Bug towards center and verify the horizontal command bar starts moving as the Heading Bug is adjusted.	_____	_____
15.9	Repeat steps 15.6 thru 15.8 until the horizontal command bar moves with the Heading Bug up to the roll limit of the autopilot.	_____	_____
15.10	Slowly adjust the Heading Bug to null and verify the horizontal command bar centers in a satisfactory manner.	_____	_____
15.11	Adjust the Heading Bug to the right roll limit of the autopilot and verify the horizontal command bar moves to full-scale deflection.	_____	_____
15.11.1	If the horizontal command bar does not move to full-scale deflection, adjust the command bar drive per the autopilot Maintenance Manual for a balanced drive.	_____	_____

16.0 FLIGHT DIRECTOR VERTICAL TEST: (OPTIONAL)

16.1	Center the Heading Bug on the EFIS and verify the horizontal command bar is centered on the PFD.	_____	_____
16.2	Verify the vertical command bar is centered on the FPM	_____	_____
16.3	Adjust the FLIGHT DIRECTOR SCALING – VERTICAL to 150 mV/Deg.	_____	_____
	NOTE: If autopilot does not have a Go-Around mode, skip to step 16.9.		
16.4	Press the Go-Around button for the autopilot and verify the vertical command bar pitches up.	_____	_____

		PASS	FAIL

16.5	Adjust the FLIGHT DIRECTOR SCALING – VERTICAL until the vertical command bar is at full-scale deflection up.	_____	_____
16.6	Reset the FD and verify the vertical command bar is centered.	_____	_____
16.7	Go to step 17.0		
16.8	Set the autopilot attitude source for 10° pitch down and 0° roll.	_____	_____
16.9	Verify vertical command bar is at full-scale deflection up.	_____	_____
16.10	Adjust the FLIGHT DIRECTOR SCALING – VERTICAL until the vertical command bar is at full-scale deflection up.	_____	_____
16.11	Slowly rotate the autopilot attitude source and verify the vertical command bar starts moving at 10°.	_____	_____
16.12	Repeat steps 16.9 thru 16.11 until the vertical command bar moves off of full-scale deflection below 10°.	_____	_____
16.13	Slowly rotate the autopilot attitude source until level and verify the vertical command bar satisfactorily moves to null.	_____	_____
16.14	Set the autopilot attitude source for 10° pitch up and 0° roll.	_____	_____
16.15	Verify the vertical command bar is at full-scale deflection down.	_____	_____
16.15.1	If the vertical command bar is not at full-scale deflection, adjust the vertical command bar drive per the autopilot Maintenance Manual for balanced drive.	_____	_____
16.16	Slowly rotate the autopilot attitude source to level and verify the vertical command bar satisfactorily moves to null.	_____	_____

17.0 END OF TEST:

		PASS	FAIL
17.1	Turn off the autopilot and EFIS.		

17.2 Secure power to the EFIS.

Chapter 6

Flight Functional Test

1.0 GENERAL

1.1 REFERENCE DOCUMENTS

Note: The following documents should be readily available during testing.

DOCUMENT	VENDOR	DOCUMENT NUMBER	REV.
PILOTS GUIDE	Chelton Flight Systems	150-045240	
AUTOPILOT OPERATION MANUAL	MISC.		

2.0 PURPOSE

2.1 To conduct a functional flight test, to evaluate / verify proper operation and accuracy of the multi-sensor, Chelton EFIS System, including operational functions, transfer functions, switching functions, and electrical bus switching, pertaining to the EFIS installation.

		PASS	FAIL

3.0 FLIGHT TEST:

NOTE: All test flights should be conducted in day VFR conditions away from traffic as needed.

NOTE: The aircraft's autopilot must be aligned per the autopilot manufacturers Installation Manual prior to flight.

3.1 Connect a Laptop computer with AIU Maintenance program to the AIU Maintenance connector. Apply power to the laptop and launch the program

3.2 Trim the aircraft for straight and level flight with little or no turbulence.

NOTE: Heading Bug and Flight Plan modes must be turned

		PASS	FAIL

off before starting tests.

4.0 HEADING DATUM TEST:

4.1	Activate the Heading mode on the autopilot. Verify the aircraft maintains the current heading without any wandering or oscillations.	_____	_____
4.2	Activate the Heading Bug on the EFIS and verify the bug is centered.	_____	_____
4.3	Maintain the current heading for 2-5 minutes and verify the aircraft heading has minimal drift or oscillation.	_____	_____
4.3.1	If the aircraft drifts off heading, adjust the *AUTOPILOT NULL – HEADING* in the AIU Maintenance program to cancel the drift.	_____	_____
4.4	Move the Heading Bug 10° left or right and verify the autopilot banks with authority then captures the new heading with minimal overshoot or undershoot.	_____	_____
4.4.1	If the aircraft does not produce satisfactory results, adjust the *AUTOPILOT SCALING – HEADING* to meet the desired result. *NOTE: In most autopilots, a 10° Heading Datum change will result in a 10° angle of bank. Refer to the autopilot POH for details on Heading Datum vs. roll angle. An increase in the AUTOPILOT SCALING – HEADING is required if the autopilot undershoots or drifts to the new heading. A decrease in the AUTOPILOT SCALING – HEADING is required if the autopilot overshoots the new heading.*		
4.5	Move the Heading Bug 20° left or right and verify the autopilot banks the aircraft with authority then captures the new heading with minimal overshoot or undershoot.	_____	_____
4.5.1	If the aircraft does not produce satisfactory results, adjust the *AUTOPILOT SCALING – HEADING* to meet the desired result.		
4.6	Move the Heading Bug 30° left or right and verify the autopilot banks the aircraft to the roll limit of the autopilot then captures the new heading.	_____	_____

		PASS	FAIL
4.6.1	If the aircraft does not produce satisfactory results, adjust the *AUTOPILOT SCALING – HEADING* to meet the desired result.		
4.7	Program a multi-leg flight plan with an IFR approach to an airport.		
4.8	Deactivate the EFIS Heading Bug.	_____	_____
4.8.1	Verify the autopilot maintains the HITS sky boxes while enroute mode is active.	_____	_____
4.8.2	Reduce aircraft speed to Vproc and verify the autopilot maintains horizontal flight within the HITS boxes thru the procedure turns of the approach.	_____	_____
4.9	If the autopilot does not maintain flight thru the HITS boxes, perform the following:		
4.9.1	Program a flight plan with at least one turn that is greater than 90°.		
4.9.2	Ensure aircraft TAS is at Vproc and there are minimal cross-winds.		
4.9.3	Set the MFD to the MAP display and zoom the range to 5 nm (1st ring labeled 2.5).		
4.9.4	As the aircraft starts a turn, verify the aircraft bank angle is 15°.	_____	_____
4.9.5	View the Projected Path symbol (white arc radiating from the aircraft symbol on the MFD) and determine if the path overlays the flight plan.		
4.9.5.1	If the Projected Path symbol has a larger radius than the flight path, increase the *ANALOG GAIN* in the IDU Limits program.		
4.9.5.2	If the Projected Path symbol has a smaller radius than the flight plan, decrease the *ANALOG GAIN* in the IDU Limits program.		
	NOTE: Setting the ANALOG GAIN value may take more than		

		PASS	FAIL

one test flight to produce a satisfactory result.

5.0 COURSE DATUM TEST:

5.1	Turn off the flight plan and verify the aircraft maintains wings level.	_____	_____
5.2	Press the OBS button on the EFIS and select GPS as the HSI source.	_____	_____
5.3	Program a simple 2 waypoint flight plan (Nearest, Direct-To, etc.) into the EFIS.	_____	_____
5.4	Place the autopilot in Nav mode and verify the autopilot captures the flight plan.	_____	_____
5.5	Maintain current heading for 2-5 minutes and verify the aircraft heading has minimal drift or oscillation.	_____	_____
5.5.1	If aircraft heading drifts, adjust the *AUTOPILOT NULL – COURSE* in the AIU Maintenance program to cancel the drift.	_____	_____
5.6	From the OBS submenu on the PFD, rotate the right-hand encoder to place the OBS in manual mode for the GPS and adjust the OBS to a 90° heading difference.	_____	_____
5.7	Fly the aircraft for 1-2 minutes in this mode.		
5.8	Press the AUTO item (Direct-To button) and verify the autopilot turns the aircraft back to the original flight plan.	_____	_____
5.9	Ensure the MFD is in the MAP mode and the range is set to 5 nm (1^{st} ring labeled 2.5 nm).	_____	_____
5.10	As the aircraft approaches the flight plan, verify the autopilot captures the flight plan with one oscillation maximum.		
5.10.1	If the autopilot overshoots the capture, reduce the *AUTOPILOT SCALING – COURSE* in the AIU Maintenance program to produce a satisfactory result.		
5.10.2	If the autopilot undershoots the capture, increase the *AUTOPILOT SCALING – COURSE* in the AIU Maintenance program to produce satisfactory results.		

		PASS	FAIL

5.10 Program a flight plan with at least one procedure turn.

5.11 Verify the aircraft maintains the HITS boxes thru the straight segments and during the procedure turn. _____ _____

NOTE: Navigating the HITS boxes using Nav mode will be less responsive than using Heading mode.

6.0 NAVIGATION TEST:

6.1 Press the OBS button on the EFIS and select a Nav radio.

6.2 Set the EFIS MFD to the HSI page and activate the HSI symbology on the PFD.

6.3 Tune the Nav radio to a local VOR station and rotate the EFIS Course pointer to the station.

6.4 Verify the CDI needles on the PFD and MFD are active and display to the station. _____ _____

6.5 Tune the Nav radio to an ILS frequency and request clearance to perform a coupled ILS approach.

6.6 Verify the autopilot captures the Localizer and the CDI on the PFD and MFD are displaying the localizer. _____ _____

6.7 Verify the autopilot captures the Glideslope and the Glideslope deviation bar is displayed on the PFD and MFD. _____ _____

7.0 FLIGHT DIRECTOR TEST:

7.1 Place the autopilot in heading mode and set the EFIS HSI to GPS.

7.2 Remove any active flight plan on the EFIS.

7.3 Activate the Heading Bug and center to the aircraft heading.

7.4 On the PFD, select the FD mode and verify the command bars are centered on the FPM. _____ _____

7.5 Set the aircraft for a straight and level flight and verify the command bars are centered on the FPM. _____ _____

		PASS	FAIL

7.5.1 If the horizontal command bar is not centered, adjust the *FLIGHT DIRECTOR NULL – HORIZONTAL* until the H-bar is centered on the FPM.

7.5.2 If the vertical command bar is not centered, adjust the *FLIGHT DIRECTOR NULL – VERTICAL* until the V-bar is centered on the FPM.

7.6 Press the OBS button on the EFIS and set the EFIS HSI to Nav1.

7.7 Tune the Nav1 receiver to an ILS frequency and request clearance to perform a coupled ILS approach. _____ _____

7.8 Verify that as the autopilot performs the approach, the FD command bars are satisfactory in their response. _____ _____

7.8.1 If the horizontal or vertical command bars do not respond to the test Pilot's satisfaction, adjust the *FLIGHT DIRECTOR SCALING – HORIZONTAL* and/or *FLIGHT DIRECTOR SCALING – VERTICAL* and perform steps 7.7 and 7.8 until command bar operation is acceptable.

8.0 END OF TEST:

8.1 Additional flight tests of other systems may be performed at this time.

Chapter 7

Troubleshooting

The following table provides additional information for the repairman to troubleshoot and repair the AIU installation.

PROBLEM	CAUSE	SOLUTION
IDU displays "AUX SENSOR" flag and the "AIU" is failed in the *FAULTS* menu.	1. Defective wiring to AIU	1a. Verify AIU circuit breaker is in. Reset breaker. 1b. Verify power is present on AIU J2 pins 1 and 6. Repair wiring as necessary. 1c. Verify continuity between AIU J2 pins 2 and 7 and airframe ground. Repair wiring as necessary. 1d. Verify communication wires from AIU to IDU(s) are correct and not shorted to each other or ground. Repair wiring as necessary.
AIU does not communicate with laptop computer	1. Defective wiring to AIU Maintenance connector 2. Laptop Com port discrepancy	1. Verify communication wires from AIU to AIU Maintenance connector are correct and not shorted to each other or ground. Repair wiring as necessary. 2a. Ensure that power management functions of the laptop computer are disabled. 2b. Ensure any programs on the laptop do not conflict with the AIU Maintenance program for Com port assignment.
Nav1 or Nav2 VOR is out of spec. on the EFIS	1. Nav radio 2. VOR alignment	1. Verify the Nav receiver is within spec for composite VOR. Repair radio as necessary. 2. Perform VOR alignment procedure from AIU Maintenance program for defective Nav.
Nav1 or Nav2 LOC is out of spec. on the EFIS	1. Nav radio 2. LOC alignment	1. Verify the Nav receiver is within spec for composite LOC. Repair radio as necessary. 2. Perform LOC alignment procedure from AIU Maintenance program for defective Nav.

PROBLEM	CAUSE	SOLUTION
Autopilot always flies No1 Glideslope	1. Wiring error	1a. Verify wiring from Glideslope receivers to the AIU P1 and J3 are correct. Repair wiring as necessary. 1b. Verify Glideslope Select wire from AIU P1 pin 45 is connected to AIU J3 pin 20. Repair wire as necessary. 1c. Verify wiring from AIU J3 to Autopilot is correct. Repair wiring as necessary.
Radar Altimeter is not displayed on the EFIS	1. Radar Altimeter mode 2. Wiring error	1. Verify the Radar Altimeter Mode is set correctly in the AIU Maintenance program. 2. Verify wiring from Radar Altimeter is connected properly to the AIU. Repair wiring as necessary.
ADF is not displayed or is wrong on the EFIS	1. ADF mode 2. Wiring error	1. Verify the ADF DC Sin/Cos Mode is properly selected in the AIU Maintenance program. "3Sin/3Cos" for DC input, "None" for ARINC-407 XYZ input. 2. Verify wiring from the ADF receiver is connected properly to the AIU. Repair wiring as necessary.
Marker Beacon is not displayed on the EFIS	1. MB setting 2. Wiring error	1a. Verify that the Marker Beacon Polarity is set for the type of input in the AIU Maintenance program. Set the polarity as necessary. 1b. Verify that the Marker Beacon Threshold is set for the type of input in the AIU Maintenance program. Set the threshold as necessary. 2. Verify the wiring from the Marker Beacon receiver is connected properly to the AIU. Repair wiring as necessary.
Marker Beacon light always displayed on the EFIS	1. AIU Maintenance programming 2. MB excitation	1. Verify threshold and polarity in AIU Maintenance program is set correctly. 2. Verify excitation voltage is present on AIU P3, pins 27, 29, and 42 for active low Marker Beacon.

PROBLEM	CAUSE	SOLUTION
Autopilot heading does not function or is backwards	1. Wiring error	1a. Verify the wiring from the Heading Datum output of the AIU is correct for the type of heading input to the autopilot (DC, 400Hz, and 5KHz). Repair wiring as necessary. 1b. Verify interconnect wiring between AIU P2 and J3 is correct for the type of Heading Datum (400Hz, 5KHz). Repair wiring as necessary. 1c. Verify the DC Bias or AC Excitation is properly wired from the autopilot or AC source to the AIU. Repair wiring as necessary.
	2. AIU Maintenance programming	2. Verify the Autopilot Heading Polarity is correct for the autopilot requirements. Select the proper polarity as required.
Autopilot heading is not centered	1. AIU Maintenance programming	1. Set the Autopilot Heading Null per Chapter 6, Step 4.0 thru 4.3 as required.
Autopilot overshoots or undershoots the Heading Bug	1. AIU Maintenance programming	1. Perform the Heading Gain alignment per Chapter 6, Steps 6.1 thru 6.6 as required.
Autopilot course does not function or is backwards	1. Wiring error	1a. Verify the wiring from the Course Datum output of the AIU is correct for the type of Course input to the autopilot (DC, 400Hz, and 5KHz). Repair wiring as necessary. 1b. Verify interconnect wiring between AIU P2 and J3 is correct for the type of Course Datum (400Hz, 5KHz). Repair wiring as necessary. 1c. Verify the DC Bias or AC Excitation is properly wired from the autopilot or AC source to the AIU. Repair wiring as necessary.
	2. AIU Maintenance programming	2. Verify the Autopilot Course Polarity is correct for the autopilot requirements. Select the proper polarity as required.
Autopilot Course is not centered	1. AIU Maintenance programming	1. Set the Autopilot Course Null per Chapter 6, Step 4.4 thru 4.6 as required.

PROBLEM	CAUSE	SOLUTION
Autopilot Course is sluggish	1. AIU Maintenance programming	1. Set the Course Scale to the same value as the Heading Scale per Chapter 6, Step 7.1 as required.
Flight Director does not display on EFIS	1. EFIS Setup 2. Wiring error 3. AIU Maintenance programming	1. Verify "FD" is selected on the EFIS PFD declutter menu. 2. Verify wiring from the Autopilot to the AIU is correct. Repair wiring as necessary. 3. Verify the Flight Director Flag Polarity is properly set if applicable on the AIU Maintenance program. Select the proper polarity for the FD Valid flag.
Flight Director command bar scaling is not correct vertically or horizontally on the EFIS	1. AIU Maintenance programming	1. Verify the Horizontal and Vertical scales are set properly for the Autopilot or Flight Director computer output. Set the proper values in mV per Degree.
Flight Director command bars are not centered on the EFIS	1. AIU Maintenance programming	1. Set the Flight Director Null values for horizontal and/or vertical as required to center the FD command bars on the EFIS when the Autopilot or Flight Director Computer is in a centered condition.
Flight Director horizontal command bars are backwards on the EFIS	1. Wiring error 2. AIU Maintenance programming	1. Verify the Left/Right wires from the Autopilot or Flight Director Computer are wired correctly to the AIU. Rewire as necessary. 2. Verify the Flight Director Horz Polarity is set correctly in the AIU Maintenance program. Set the proper polarity.
Flight Director vertical command bars are backwards on the EFIS	1. Wiring error 2. AIU Maintenance programming	1. Verify the Up/Down wires from the Autopilot or Flight Director Computer are wired correctly to the AIU. Rewire as necessary. 2. Verify the Flight Director Vert Polarity is set correctly in the AIU Maintenance program. Set the proper polarity.